THE RELATIONSHIP BETWEEN TEACHER ATTITUDES AND SKILLS AND STUDENT USE OF COMPUTERS IN NORTHERN SCHOOLS

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ABSTRACT

The purpose of this study was to determine if a relationship exists between the attitude and ability of teachers and the computer use of students in northern Saskatchewan schools. A secondary purpose was to determine if a relationship exists between the demographic and environmental variables of teachers and student computer use.

This study utilized a sixty-two item survey, the Teachers Computer Survey, comprised of a computer attitude assessment instrument and a computer ability assessment instrument. Demographic and environmental variables of teachers were examined. Three aspects of student computer use were examined; overall frequency of student computer use, frequency of specific types of computer use; and frequency of computer use in specific subject areas. The survey was distributed to all K-12 teachers (n=525) in Provincial and First Nation schools in the Northern Educational Region of Saskatchewan. The target population consisted of 525 teachers employed in three provincial school divisions and two tribal councils representing 48 schools.

A number of correlation procedures and analysis of variance procedures were utilized to test the hypotheses formulated in the study. No significant relationship was found between the attitude, ability, demographic or environmental variables of teachers and the overall frequency of student computer use. However, a significant relationship was found between these variables and the frequency of specific types of student computer use as well as the frequency of computer use in specific subject areas.

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INTRODUCTION

1.1 Background

Technology has the potential to enhance the quality of life of people. It is ironic when technology may in fact be having the opposite effect. It is this ironic situation that the people of northern Saskatchewan now find themselves confronting. Skilled employment opportunities are plentiful, yet unemployment is high. As is common across the country, the technology "skills" of the people are not at the level to meet the technology "needs" of industry. Until we understand why this dilemma exists, and more importantly, endeavor to correct it, the situation will persist. This study is a part of that process. It examined one aspect of the technology skills gap dilemma; the role that teachers play in the computer education of students in northern Saskatchewan.

Northern Saskatchewan is the term used to describe the top "half" of the province of Saskatchewan. The Northern Administrative District (as defined in the Northern Municipalities Act, 1983), is an area encompassing nearly 300 000 square kilometers of the physical land mass of the province. Although "The North" (as it is commonly referred by its residents) accounts for nearly one half of the geographical area of the province, only slightly more than 3% of the province's one million people live in the region. Of that 3%, 60% live in communities of less than 1000 people. The majority of the people are of Cree, Dene or Metis heritage. Aboriginal people form 81% of the population in northern

Saskatchewan, compared to 11% provincially and 3% nationally (Northern Labour Market Committee, 2002).

In addition to the high percentage of Aboriginal people, two other characteristics define the population of northern Saskatchewan; it is young and growing. In stark contrast to the rest of the province, the northern population is considerably younger. 82% of the population is under the age of 44, compared to 64% provincially. In addition, 53% of the population is under the age of 25, compared to 36% in the province as a whole. Projected population growth is high. Whereas the population of the province over the next fifteen years is expected to grow by 1%, the population of the "the North" is expected to increase by 38 % (Northern Labour Market Committee, 2002).

The socioeconomic status of the region is much lower in many categories than the rest of the province. The rate of unemployed adults over age 25 is three times as high in the north. The overall unemployment rate in the north is 20 % compared to 7 % provincially (Northern Labour Market Committee, 2002).

Although unemployment levels in the north are nearly three times as high as in the rest of the province, the paradox is that employment opportunities in a number of resource sectors exist. These jobs, as part of agreements between government and industry, are targeted for northern Aboriginal people. The jobs are simply not being filled. In the mineral sector, for example, the six uranium mines in northern Saskatchewan account for all of Canada's uranium production. Gold, copper and silica mines are also in operation. In addition to Saskatchewan's own oil and gas exploration, neighbouring Alberta and the Fort McMurray Oil Sands provides many employment opportunities in the oil and gas

sector. Investment by the provincial and federal governments in the development of the forestry industry has seen an increase of employment potential in that sector. In addition, providing housing and infrastructure to a growing population has created a sustained demand for trades people in the construction sector (Northern Labour Market Committee, 2002).

This paradox can more succinctly be referred to as the "technical skills gap". Jobs in the twenty-first century require higher skill levels, and northerners are not meeting that skill level to benefit from the jobs. In the mining industry for example, new techniques require higher technical skill levels. As the Regional Co-ordinator of Cameco, one of the world's largest uranium mining companies points out,

> Northerners want jobs but often do not have the skills to get them. We need more technical and professionally trained northerners. We need assistance in preparing people, especially young people, to fill those positions. It will not happen overnight, we are looking at the long term. It may take 10 years or a generation to accomplish (Cameco Access Program for Engineering and Science Annual Report, 1998, p. 13).

The lack of technical skills has restricted employment opportunities in the oil and gas industry as well. Economic growth in Fort McMurray, the world's largest oil sands recovery project, is expected to continue steadily over the next four years and peak in 2006. The creation of 6000 new jobs directly in the oil patch is anticipated. It is also expected that the inability to find skilled workers will continue. La Loche, a Dene community of about 5000 people located 75 km from Fort McMurray, has an unemployment rate estimated to be between 80% and 90 % (Northern Labour Market Committee, 2002).

The following example provides a clear illustration of the "technical skills gap" as demonstrated in the recent efforts of the Oil Sands Sub-committee. The Oil Sands Sub-committee is comprised of representation from the provincial and federal governments, northern communities and training institutions. The singular purpose of the committee is to get northerners employed at the oil sands projects in Fort McMurray. Two full time managers undertake this initiative. Over its two-year existence, hundreds of people from across Canada have secured jobs in the oil sands, however, not one northerner has gained employment through the efforts of this project (Oils Sands Sub-Committee of the Northern Labour Market Committee, Minutes, October 2002). When the manager of the Oil Sands Project was asked to explain why this was the case, his response illustrates the impact of the "technical skills gap" and its significance to the type of jobs the industry requires.

> There are a number of reasons why people are not getting jobs in the Oil Sands, but one of the big reasons is that they don't have the computer skills. First, they don't have the computer skills to even apply since all of the applications for jobs are now on line; and second they don't have the computer skills that the companies are requiring. It really is a barrier. (Oils Sands Sub-Committee of the Northern Labour Market Committee, Minutes, October 2002)

This then, provides the context for this study. In summary, in order to enhance the quality of life for many disadvantaged northerners, employment has to increase. Job opportunities exist, but northerners are not taking advantage of the opportunities and filling the jobs. Employment opportunities require technically skilled and computer literate people, and currently, many people in the region seeking employment do not have these skills. Arguably, there are a number of reasons why northerners have not been meeting the need for skilled employment. This study looks at one piece of the puzzle by surveying

teachers in the provincial and First Nation school systems to determine whether or not they are preparing students for the new reality of a computer literate workforce. In a general sense, the study will provide a snapshot of student computer use.

1.2 Purpose of the Study

The purpose of this study is to show whether teachers' attitudes toward computers and competency in using computers as an effective educational tool (computer ability) are factors that are related to the frequency and type of computer use by students. In addition, this study will determine if the demographic and environmental variables of teachers are related to the frequency and type of computer use of students.

1.3 Research Question

The following research question provides the direction for this study.

Are teacher attitudes, computer ability, demographic profile and working environment related to student computer usage?

1.4 Research Goals

This study will examine how the attitude, ability, demographic and environmental variables of teachers are related to the computer use of students.

1.5 Rationale for the Study

Although pre-existing data specific to the computer use of students in northern Saskatchewan are scarce, general data reveal that our public schools have increased the number of computers in their facilities. In the early part of the decade, most schools had about one computer for every 20 to 25 students. By the end of the decade, these numbers overall in Saskatchewan have dropped to around eight students for every computer (Statistics Canada, 1999). One can anticipate that well before the start of the next decade, a computer for every student will be the norm.

Schools have increased the level of technology, or more precisely the number of computers, within their walls, however, this has not necessarily translated into an increased use of computers. Recent data from the Saskatchewan Department of Education show that overall in the province about 70% of grade 5 students, 90% of grade 8 students and 90% of grade 11 students report they use a computer to do school assignments at least once a week (Saskatchewan Education, 2001). At first glance, this looks like a positive indicator, however, further analysis reveals that of the same grades, 65%, 55%, and 50% respectively, report that they use a computer less than one hour per school week. Considering there are 25 instructional hours in a typical school week, we can deduce that the majority of students in grades 5, 8 & 11 in Saskatchewan use a computer less than 4% of the time they are in school. This is consistent with a previous study by this author showing that 52% of students at grade 5, 56% of students at grade 8, and 59% of students at grade 11, spent less than 1 hour per week on a computer in school (Greschner, 1997). This is well below the benchmark set by the Saskatchewan Department of Education in consultation with its

partners, the Saskatchewan Teachers Federation, the Saskatchewan School Trustees Association and the League of Educational Administrators, Directors and Superintendents. This group established 2 hours per week at grade 5, 5.1 hours per week at grade 8 and 5.2 hours per week at grade 11 as the standard for students. Less than 12% of students at grade 5, less than 5% of the students at grade 8 and less than 26% of the students at grade 11 are meeting the standards of computer usage established by Saskatchewan's educational stakeholders (Saskatchewan Education, 2001).

In short, Saskatchewan students are significantly underachieving in meeting the standards of computer usage at school. "Most Saskatchewan students do not use computers at school as frequently as expected" (Saskatchewan Education, 2001, p. 8). This research project examines the issue of frequency of computer use of students by determining if a relationship exists between the computer use of students and the characteristics of teachers. Specifically, the study examines teachers' attitudes towards computers and their ability to use computers. It also examines demographic and environmental characteristics of teachers.

Many studies have assessed the computer attitude of both pre-service and inservice teachers (Delcourt and Kinzie, 1993; Francis, 1993; Kay, 1993b, Kluever, Lam, Hoffman, Green & Swearingan, 1994; Koohang, 1989; Larson & Smith, 1994; Loyd & Gressard, 1984a, 1984b, 1985; Metu, 1994; Mitra, 1998; Necessary & Parrish, 1996; Nash & Moroz, 1997b; Omar, 1992; Pepper, 1999; Reece & Gable, 1982; Zoller & Ben-Chaim, 1996). Most of these studies also examined the computer ability of the subjects. In the majority of cases, it was found that a positive relationship existed between the computer attitude of

respondents and their computer ability. The general consensus seems to be that a higher degree of computer ability translates into a more positive computer attitude. Further, most of these studies examine demographic variables such as age, gender and educational background.

Not nearly as numerous as studies into the attitude and ability of teachers, a relatively small number of studies have examined the frequency and type of computer use demonstrated by students in schools. The primary purpose of this study is not a comprehensive examination of what students are doing with computers in schools. The purpose rather, is to determine if a relationship exists between teachers' attitudes towards computer use, the level of their ability to use computers and the computer use of students. To assess student computer use, the same criteria as those employed in the *1999 Provincial Learning Assessment in Technological Literacy* (Saskatchewan Education, 2001) have been utilized. Three components of student use were examined: The overall frequency of computer use, the frequency of specific types of computer activities and the use of computers in subject areas. A comprehensive and critical assessment of how effectively students are using computers in the classroom is beyond the scope of this study. This study focuses on the relationship between the characteristics of teachers and student computer use.

As stated, Saskatchewan students are not achieving the computer usage standards established by educational stakeholders in Saskatchewan. "Most Saskatchewan students do not use computers at school as frequently as expected" (Saskatchewan Education, 2001). Data also revealed that students primarily used computers, (in order of frequency) for

keyboarding, word processing, Internet, and e-mail. Far down the list, and indicating very little frequency, were the applications of spreadsheets, databases, multimedia, graphics and programming. Data also revealed that in only one subject area (language arts) did more than half of the students surveyed indicate that they had used a computer in that subject area. In all the other subject areas (math, social studies, science, arts, health/wellness, phys-ed and French) fewer than half of the students indicated they had used a computer.

It is speculated that this under-utilization of computers in schools may in part be a contributing factor to the "skills gap", or more precisely the lack of technical skills experienced by northerners seeking employment. In order to ascertain this, the computer use of students needs to be determined. The factors that play a role in that use also need to be determined.

This study is of value for many reasons. The study is a snapshot of the use of computers in the teaching and learning process in northern Saskatchewan. The study provides insight into what is going on in schools, and by extension, may be of some use to those who are trying to close the "technical skills gap". The study also provides information to those responsible for the educational system that may be of help to determine the inservice needs of teachers and to assess the level of computer integration across the curriculum.

1.6 Delimitations

This study had the following delimitations:

1. The assumptions made on student usage are based upon information provided by teachers. Students were not asked to comment on their computer use.
2. This survey only examined student computer use in school and did not examine student computer use outside the school.
3. This study only included teachers from northern Saskatchewan.

1.7 Limitations

This study had the following limitations:

1. The study used the researcher-designed questionnaire Teachers Computer Survey
2. The study was limited to a random sample of teachers from the target population.
3. Requests for teachers to participate and the survey itself were only sent to schools only once. Follow up surveys were not sent.
4. Limitations of all survey type research need to be acknowledged, such as clarity of wording, descriptions and terminology.
5. This study assumed that participants responded honestly about their own computer attitude and ability.
6. This study assumed that teachers responded honestly about the computer use of their students.

1.8 Definition of Terms

The following are definition of terms commonly used in this study:

1. **Provincial School** refers to a school as defined by the Education Act , 1995 and governed by a board of elected trustees.
2. **First Nation School** is a school administered within the Indian Act.
3. **Tribal Council** is a term used to describe an association of First Nations.
4. **Survey** and questionnaire are used synonymously to define the tool used to collect data.

1.9 Summary of the Study

Chapter One has provided the context, rationale and purpose of the study. It presents the research question that is answered, its delimitations, limitations, and definition of terms. Chapter Two reviews the literature relevant to the topic. Chapter Three describes the research methodology, the instrument used and the population studied. Chapter Four presents the data derived from the survey, while Chapter Five examines and discusses the findings. Chapter Six summarizes the study, highlights the significant findings, draws conclusions and makes suggestions for future research.

Chapter Two

LITERATURE REVIEW

2.1 Introduction

This chapter provides a review of the literature relevant to the research questions that have been presented. It examines prior research done to assess computer attitude and abilities, as well as student computer use. This chapter is divided into four sections. The first section will examine prior research on attitudinal assessment, specifically attitudes about computers. The second section will review a number of studies that have been done to assess computer ability, with the focus being on teacher-specific research. The third section looks at prior methods of assessing computer usage of students. The final section provides a summary and discusses the relevance of this study.

2.2 Attitude Assessment

Accurately assessing the attitude that individuals have towards any subject such as the very narrow topic of computers, is for the most part a difficult task. An examination of the literature around the assessment of "computer attitudes" reveals that most instruments designed for this purpose follow a similar format. First, the instrument looks at demographic variables (gender and age) followed by a Likert-type or forced choice pairs of questions designed to elicit a positive, negative or 'somewhere in between' response.

Numerous models of assessing computer attitudes have been around since the days of punch cards. Almost thirty years ago, Lee (1970) conducted a national computer survey.

Given the fact that most people at that time had never seen a computer, it was not surprising that attitudes were somewhat apprehensive. In reality, research about attitudes towards computers prior to the advent of the microcomputer (circa 1982) provides very little useful information.

It was the advent of the "PC" that saw a rise in the research around computer attitudes. The *Beliefs about Computers* scale developed by Ellesworth and Bowman (1982) was an early, albeit small, attempt at assessing something similar to computer attitudes. The sample consisted of computer enthusiasts and though it may have provided an accurate assessment of that sample, the sample was not representative of the population at large. Similarly, the work of Williams, Coulombe & Lievrouw (1983) was drawn from a population with a bias toward computer use. This researcher did not find any further studies that utilized the instrument used in either of these two studies.

Reece & Gable (1982) were among the first to examine all three of the attitudinal domains, cognitive, affective and behavioral in their study *The Development and Validation of a Measure of General Attitudes Towards Computers.* This study was small and restricted to only grade seven and eight students. Although this study was innovative in assessing all three of the cognitive domains, no further uses of this instrument were found.

The first instrument to gain universal acceptance as a means to assess attitudes towards computers, was the Computer Attitude Scale (CAS) developed by Loyd and Gressard, (1984a, 1984b). The Likert type instrument consisted of thirty items that could be broken down into ten questions in each of the three sub-categories of computer anxiety,

computer confidence and computer liking. The thirty statements were a mix of positively and negatively worded statements. The subject was asked to respond to each statement by choosing either 1= strongly disagree, 2=slightly disagree, 3=slightly agree, and 4=strongly agree. The statements were structured in such a way that, in general, a high score correlated to a more positive attitude towards computers. The study involved 155 grade eight through twelve students.

> The reliability coefficients of the three subscales and the findings of the factor analysis suggest that the scores of the three subscales are sufficiently stable to be used as separate scores. Because the magnitude of the intercorrelations among the subscales of the large loadings on the initial factor in the factor analysis indicate that the three subscales share a large amount of common variance, the total score based on the three subscales could reasonably be interpreted to represent a general attitude toward working with computers that reflects liking, confidence and freedom from anxiety (Loyd & Gressard, 1984a, p.504).

The following year, the use of Loyd and Gressard's instrument moved beyond middle level students and was tested with teachers. The sample consisted of 114 teachers (33 male, 81 female) enrolled in courses pertaining to the role of microcomputers in education. Many of the respondents had no experience with microcomputers. The results from this study showed that not only could the CAS "be used reliably and validly to assess computer attitudes of teachers" (Loyd & Loyd, 1985, p.19), but it also showed that attitudes towards computers seemed to be related to amount of computer experience one had (Loyd & Loyd, 1985).

A further study, *Validation studies of a New Computer Attitude Scale* (Gressard & Loyd, 1986) using a sample of n=192 school teachers found that the scores of the three subscales were sufficiently stable. By administering a parallel instrument, in the form of

interviews with participants, it was determined that the CAS had reasonable convergent validity. Finally, by administering the instrument in a pre and post instructional setting, this study determined that the CAS is sensitive to computer attitudinal changes over time.

Koohang (1987) was one of the first to use the CAS in conjunction with other variables. Specifically the study examined the role of gender, computer experience, and nature of computer experience and each of the three subscales of attitudes (anxiety, confidence and liking). The sample (n=60) consisted of education students. With respect to gender, males obtained a slightly higher score than females, which would reflect a more positive attitude towards computers. To measure computer experience, subjects were asked to select from among five options ranging from less than a week of experience up to more than a year. The results showed that subjects who had more computer experience had a more positive attitude toward using a computer. Respondents were asked to select from one of four responses; level 1, observation only and/or computer games; level 2, experience with word processing and data entry, level 3, workshop and/or introduction to software evaluation, level 4, programming and/or instructional applications taken as credit hours at the university level. The findings showed that subjects that obtained their experience at higher levels had a more positive attitude towards computers. A further study of 265 teachers from 20 school districts (Kluever et al., 1994) again demonstrated the instrument is reliable and valid.

A cross-cultural assessment of the instrument was done in 1994 (Kim 1994) on a group of Korean college students (n=303). The results showed that Korean students generally had a less positive attitude toward computers than did their American

counterparts. The authors of this study suggest that the lower attitude may be a result of "Korean college students having less interaction with computers in everyday life" (Kim 1994). They conclude, "further research is needed to investigate causes of Korean students' differentiated feelings towards computers" (Kim 1994).

Another cross-cultural study was conducted by Metu (1994) in a study of Nigerian teachers. His forty question Likert instrument was similar in nature to Gressard and Loyd's. Metu's relatively small sample (n=56) revealed a contradictory finding that "the majority of teachers who have a positive attitude toward computer education have little or no skills and knowledge" (Metu 1994).

A study in Australia (Lau and Ang, 1998) examined a large group of education students (n=509) and examined not only the attitude that they held with regards to computers but also queried demographic variables, knowledge and ability. This study showed no correlation between age and computer attitude, nor between gender and computer attitude. It did however, consistent with other research, determine that experience and knowledge did have an effect on attitude. (Lau and Ang, 1998)

Khine (2001) used the CAS of Loyd and Gressard (1984a) in its original form in his study of 104 first year teacher education students in Brunei Darussalam. In this current use of the instrument, it was found that the Cronbach alpha reliabilities were significantly lower than in its original use in 1984. Khine's 2001 study scored 0.66 (anxiety), 0.81 (confidence), 0.65 (liking) and 0.90 (overall) as compared to the original scores of 0.86 (anxiety), 0.91 (confidence), 0.91 (liking) and 0.95 (overall). Khine also found that the

gender gap evidenced in previous studies was only marginally present and fell within the margin of error of the study.

The issue of gender and attitude toward computers surfaces in many studies. Numerous studies have determined that males hold a more positive attitude toward computers than do females (Loyd and Gressard , 1984b; Koohang, 1989; Pope, Davis and Twing, 1991; Woodrow, 1991). Nash and Moroz (1997a) find no evidence of gender differences in attitudes toward computers. Liao (1999), on the other hand, in a meta-analysis of gender differences on attitude toward computers, found conclusively that "gender differences on attitude towards computers exists" (Liao 1999). There is conflicting evidence on this topic. Kay (1993a) reports that of ninety-eight instances of attitude measurement, researchers have found that males have more positive attitudes on forty-eight occasions; on fourteen occasions females had more positive attitudes; while on thirty-six occasions, both females and males had similar attitudes.

Necessary & Parish (1996) surveyed 157 undergraduate students to examine the relationship between computer-related attitudes and "computer experience and/or balance of computer weekly usage". The results showed that students who had a higher level of computer experience and/or balance of weekly usage showed positive results in all three subscales of the CAS; lower levels of computer anxiety, more confidence and high level of liking. A further study by the same authors (n=164) showed a positive correlation between the three subscales and the number of hours a student used a computer at home. Owning a computer was also reflected in positive increments in all three of the subscales.

In addition to the widely used CAS developed by Gressard and Loyd, a number of other instruments have been utilized. Pinto and Calvillio (1985) developed a computer attitude scale which is specifically addressed to assess computer attitudes in organizational settings. This instrument used a 20 item Likert scale where subjects indicated their level of agreement or disagreement to each item. The results of this study confirmed that computer attitude and performance were indeed linked. The results showed that younger workers had a more positive attitude than did older workers. The study also showed that males scored higher and were deemed to have a more positive attitude toward computers than did females. (Pinto and Calvillio, 1985). This study was not administered to teachers but rather to a variety of employees in the health, business and educational fields.

In an attempt to assess teachers' attitude towards technology in general and not just computers specifically, Mcfarlane, Hoffman and Green (1997) developed the *Technology Attitude Scale* (TAS). This instrument consisted of 20 items with responses provided on a seven point Likert scale, ranging from 'not true' to 'very true'. The results of the study indicated that the TAS was a reliable measurement of teachers' attitude toward technology in general, including video, audio etc. and not just computers specifically.

Pepper (1999) utilized the *Computer Literacy Attitude Survey* with a sample of 76 teachers. The instrument contained items related to the factors of liking computers; valuing computers for society and for education; anxiety about using computers; confidence with regards to learning about computers; and perceptions about gender appropriateness of computers. Subjects rated each of the items using a five point Likert scale ranging from strongly agree to strongly disagree. Information about computer experience and

demographic characteristics were also collected. The test was administered at the beginning and end of a four month long computer course. The study showed that "a systematically designed computer course did influence attitudes of preservice teachers" (Pepper, 1999). This was consistent with a previous study (Savenye, 1993) that had earlier demonstrated the change in attitude as a result of technology instruction.

Kay (1993b) developed an instrument called the *Computer Attitude Measure* (CAM). Kay's instrument focused on the three distinct dimensions of computer attitudes; cognitive, affective and behavioral. Each of these three components was assessed separately. The cognitive component was assessed using a ten question, seven point Likert item (strongly disagree, disagree, slightly disagree, neutral, slightly agree, agree, strongly agree). The affective component was assessed using ten 7-point semantic differential scale items (extremely, moderately, slightly, neither, slightly, moderately, extremely). The behavioral component was assessed using a 10 question 7-point Likert scale (extremely unlikely, unlikely, somewhat unlikely, neither, somewhat likely, likely, extremely likely). Although the instrument demonstrated a high degree of internal reliability and external validity was supported, the instrument did not gain acceptance. This researcher did not find any additional studies that used this instrument, although the results from Kay's study have been quoted extensively.

Delcourt and Kinzie (1993) examined the connection between computer attitudes and self-efficacy by using a instrument they developed called the *Attitude Toward Computer Technologies*. It consisted of a nineteen question 4-point Likert scale (strongly disagree, disagree, agree, strongly agree). This instrument showed very little difference

from the Loyd and Gressard model aside from reducing the number of questions. Simliarily, Francis (1993) developed a measure called the *Attitude Toward Computers Scale* (ATCS) that focused on the affective attitudinal domain. The 24 item 5-point Likert scale ranged from 1=strong disagreement to a 5=strong agreement.

The most comprehensive analysis of a multitude of instruments designed to measure teacher attitudes towards computers was completed by Christensen and Knezek (2000). The *Teachers' Attitude Toward Computers Questionnaire* (TAC) was administered to 621 educators in Texas, Florida, New York, and California. This instrument was comprised of 284 items, representing 32 different subscales taken from 14 previously published instruments. The study measured how well each of the 14 original instruments measured what it claims to assess. The study further sub-divided its sample into three sub categories of (a) preservice teachers, (b) practicing K-12 teachers, and (c) teacher educators. Results indicate that "most of the attitudinal subscales that were originally strong have held up well over time" (Christensen and Knezek, 2000, p.329).

2.3 Ability Assessment

Being quite prophetic, Molnar predicted in 1978 that the next great crisis in American education would be related to the quagmire of computer literacy; how to define it, measure it, assess it and describe it. The line between what is a computer skill, ability or competency has become blurred. Loyd and Gressard (1984a) saw computer literacy as the very simple measure of the amount of time individuals spent at a computer, the number of computer related courses they had taken and whether or not they owned a home computer.

Lockheed, Nielsen and Stone (1985) measured computer literacy with a 15 item Likert instrument that probed programming ability and computer vocabulary. Fetler (1985) produced an instrument that was a mix of a variety of other instruments that assessed the cognitive and affective domain.

The bulk of early work in assessing computer literacy focused on programming ability and technical skill. This is logical since up until the early 1980's, the operating of a computer was technical and programming based. As the level of sophistication and ease of use of software applications has evolved, the skills needed to operate a computer effectively have changed. What used to take hours of programming to accomplish, can be completed in a simple mouse click.

> Current hardware and software development dictates that application software skills should also be included in an assessment of computer literacy. Initially, technological awareness of computers and programming prowess was essential to the operation of computers. Very little substance could be achieved without these skills. Subsequently, with the widespread introduction of the microcomputer and user friendly application software, it has become increasingly easy to use computers, often requiring only the ability to read and write to perform highly sophisticated maneuvers. The trend towards painless and straightforward use of the computer continues today. It is important that prospective computer literacy measures include application software skills in order to be complete and technologically relevant. (Kay 1993a, p.17)

Many instruments have been developed to assess computer skills which incorporate application skills (Kay, 1990; Larson & Smith, 1994; Jones and Pearson, 1996; Austin, 1999; Ayersman, 1996). A number of comprehension assessment batteries have been developed that attempt to capture all facets of computer literacy; programming, hardware and software (Kay, 1993a). The argument against this is that it would be unreasonable to

expect everyone to have a complete range of computer related skills in order to be deemed computer literate. Kay (1993a) describes a personal needs approach to computer literacy. Basically, if you can utilize a computer to meet a specific need or a use, then that user should be considered computer literate.

One instrument that attempts to acknowledge all facets of computer literacy was developed by Kay (1993a). The instrument was divided into four subscales of (1) software ability, (2) computer awareness, (3) programming skill and (4) locus of control. *The Computer Ability Survey Measure* (CAM) consisted of five sections. The first dealt simply with demographic variables such as age, gender, computer ownership and subject area taught. The four other areas were items on each of the four subscales. The software ability subscale consisted of five, 7 point Likert items (ranging from extremely low to extremely high) and asked subjects to rate their knowledge in using computers and software. Similarly, the awareness-of-computers-in-society subscale and the programming subscale had the same five question, 7-point Likert approach. The perceived control subscales was different. It consisted of seven, 7-point Likert questions with a response that ranged from strongly disagree to strongly agree. The sample consisted of 647 pre-service teachers ranging in age from 21 to 52. A principal-component factor analysis followed by a varimax rotation of the factor solution was used to determine the factor validity of each subscale and the overall CAM. A correlation matrix incorporating the five subscales and the measure of computer attitudes, mathematical ability and software skill was used to determine the external validity of the CAM (Kay, 1993)

The instrument proved to be very reliable. The software ability and awareness subscale were combined because the principal components factor analysis revealed these items comprised a single factor. This combined subscale achieved a correlation of .94. Program skill had a correlation of .93 and the perceived control subscale had a .89 correlation. The high alpha coefficients for all three of the ability constructs suggest that they are internally reliable. The results from the principal-component factor analysis indicated that all three ability constructs were structurally independent (Kay 1993).

Larson & Smith (1994) carried out a study of first-year university students in Wisconsin to determine the amount and type of previous computer experience they had. The study found that when subjects were asked to describe their overall computer literacy, it was quite high (90 %). However, when literacy was broken down into specific skills such as spreadsheet, graphics and word processing, the numbers dropped off markedly. For example, only 47% had any experience with graphing programs.

A theme that emerges from the literature is that there are simply too many computer skills to teach all of them to everyone. No longer can computer skills be thought of in the generic sense, but rather they must be thought of in the realm of which they exist. There are skills that are transferable from one field or occupation to another, but there are many that are not. For example, being able to manipulate and interpret data on an EKG computer screen is a necessary skill for a nurse or doctor but has no relevance to a teacher. Similarly, locating resources on the Internet pertaining to educational strategies is a skill that is of little use to a draftsperson immersed in computer assisted design (CAD).

Recent research reflects this trend. Austin (1999) developed an instrument that defined and measured the computer literacy of nursing students. The context of the competencies survey was entirely medical in nature and relevant to being a successful nurse. Atkins and Vasu (2000) take this approach into the educational field by assessing very specific competencies of teachers in three areas; writing and communication, information awareness and management, and construction and multimedia. *The Teaching with Technology Instrument* (TTI) was designed with 46 yes/no questions related to the basic computer competencies recommended by the International Society for Technology in Education (ISTE) and others. A Cronbach alpha of .9462 gave the study considerable reliability. The authors concluded that the instrument was effective in determining the computer literacy of teachers (Atkins and Vasu 2000).

In light of the emphasis on occupation or task specific assessments of computer skills, the question that follows is what skills or competencies are important for teachers? Shefler and Logan (1999) have compiled a comprehensive assessment of competencies relevant to teachers. Not only have they compiled these competencies, but also they have gone through an extensive process to rank them in order of importance as determined by educators. Originally, the study started with 127 competencies derived from previous research. This list of 127 was sent to a list of educators (596) with computer expertise for a rating of importance. The competencies were broken into two sections. Section 1 consisted of general computer competencies and section two was made up of computer competencies unique to teachers. After a series of Delphi panels and reviews, the original 127 competencies were boiled down to 67 competencies. Section One, General Computer

Competencies, included four subgroups: (1) acquire a basic understanding of computer operations for personal or business use; (2) acquire a knowledge of the impact of computers on society; (3) operate and maintain the components of a computer system for home or business use; (4) develop and use a personal plan for computer competency. Section Two, Teacher Competencies Unique to Education, was composed of six sub groups: (1) Evaluate and assemble components of a computer system for instructional use; (2) acquire knowledge of the impact of computers on society; (3) develop a plan for using computers in instruction; (4) implement a plan to integrate computers into curricula; (5) Use computers in classroom management; and (6) use computer information resources (Shefler & Logan, 1999).

Results of the study showed that making computers an integral part of curriculum and instruction has the greatest importance for teachers. All 67 competencies received a mean rating of three or higher (moderately important to very important). Thirty-four specific competencies had a mean of four (important) or higher. The range of specific competency means extended from a low of 3.13 (state health hazards associated with computer use) to a high of 4.57 (use of software to facilitate instruction). Overall, group means ranged from 3.60 to 4.20. The results of this study places more emphasis on the integration of computer use in instruction as desired competencies for teachers (Shefler & Logan, 1999).

2.4 Student Usage

Numerous studies have been done to assess the computer use of students. One of the most notable was initiated in 1985 by Apple Computer. Apple Classrooms of

Tomorrow (ACOT) was a collaborative research project among public schools, universities, research agencies and Apple Computer. Over its thirteen year existence, this study provided insight into the integration of technology into instruction.

Specific data on what type of activities students are participating in is generally provided through more broad national studies. The Policy Information Center produces Computers and Classrooms: The Status of Technology in U.S. Schools. It gives a snapshot of the level access to technology in schools, student computer use, and teachers' integration of technology into instruction. More detailed analysis is conducted by The National Center for Education Statistics (U.S. Department of Education, Office of Educational Research and Improvement, 2000). It delivers a comprehensive assessment of the availability of technology in schools as well as on overview of the use by students. Similar data relevant to Canada are found on the Schoolnet website.

This study however, will focus on the results of the 1999 Provincial Learning Assessment in Technological Literacy (Saskatchewan Education, 2001). The study included nearly 3500 students in Grade 5, 8 and 11 from 182 schools throughout the province of Saskatchewan. It examined what students are doing on computers, their self-perceptions and achievements. It also examined, among other things, teachers' beliefs and perceptions about the use of computers in instruction. The process included an extensive standard setting process involving stakeholders from around the province.

The intent of this study is to use the same instrument derived for the 1999 study. Specifically, the student use assessment instrument will be employed. The overall

computer use, frequency of specific types of computer activities, and use of computers in subject areas scales will be utilized.

2.5 Summary

As shown, the literature dealing with computer attitude and ability is extensive. However, trends do emerge and gaps are evident. Studies on teacher attitudes have focused on attitudes towards computers in general and not on attitudes towards computers in education. Studies, starting from Loyd & Gressard (1984a) and spanning the next fifteen years, have tended to focus on defining and clarifying the attitudinal domains (liking, anxiety and confidence). What is needed is a study that goes beyond the assessment of a teachers' attitude toward computers in general and assesses the attitude that teachers have towards using computers in the classroom. Granted, the two approaches are not mutually exclusive, however, an instrument that can assess both the general (attitude toward computers) and the specific (attitude towards using computers in the classroom) and discern between the two, would yield interesting information.

This focused approach is somewhat more evident when examining computer ability. The recent trend in the literature shows an attempt to move away from the generic, all-inclusive assessment of computer ability towards the more focused, occupation or profession specific assessment. This would appear to be simply a reflection of the proliferation of computer technology in society. The difficulty now seems to be how to determine what skills and abilities are essential to a specific occupation or profession. As Sheffler and Logan (1999) demonstrated in *Computer Technology in Schools: What*

teachers should know and be able to do, the range of computer abilities expected of teachers is extensive. The challenge is to determine what computer abilities teachers need to have in order to incorporate the use of computers into teaching and learning and to develop a means to asses these abilities.

This literature review does not include a comprehensive review of student computer use research. Rather, this study is designed to utilize the existing instrument in the 1999 Provincial Learning Assessment in Technological Literacy (Saskatchewan Education, 2001) so as to maintain consistency. This will be illustrated in the following chapters.

Chapter Three

RESEARCH METHODOLOGY

3.1 Context of the Study

This chapter describes the methodology used in the study, the population studied, the research instrument that was used and the procedures that were followed. This study employs quantitative research methods. Data were collected from teachers using an author-designed questionnaire entitled The Teachers Computer Survey. This survey instrument is partially based upon instruments designed and utilized by other researchers. Part B of The Teachers Computer Survey , The *Computer Attitude Scale* is modeled after studies by Loyd & Gressard, (1984a), Kay (1993) and Francis (1993). Part C, the *Computer Ability Scale* is derived from the work of Sheffler and Logan (1996) and Part D parallels previous studies by Saskatchewan Education (2001).

3.2 Description of Survey Research Parameters

3.2.1 Population

The target population, as defined by Gall, Borg, and Gall, "includes all the members of a real or hypothetical set of people, events, or objects to which researchers wish to generalize their results" (Gall, Borg, and Gall, 1996, p. 220). The target population for this study was all teachers employed in First Nation and provincial schools in Northern Saskatchewan. At the time the survey was administered, the target population was n = 525.

326 teachers were employed in three provincial school divisions representing 28 schools and 199 teachers from two tribal councils representing 20 schools. Normally, a sample from an accessible population would be drawn and inferences would be made from the results of a sample from the accessible population. In this study, all teachers in the target population were invited to take part in the study by completing the survey, thereby eliminating the need to determine an accessible population and sample from within that group. Polling the entire target population ensured that the sample data collected were truly representative since each member of the target population had an equal chance of responding.

3.2.2 Research Instrument

The research instrument that was used in this study is entitled The Teachers Computer Survey. The survey is made up of five parts, each designed to assess a different aspect. What follows is a description of each part of the survey.

A number of independent demographic and environmental variables were collected. Demographic variables included gender, age, and teaching experience. Environmental variables included level of personal computer usage, access to a computer at home, access to the internet at home, use of e-mail, familiarity with Saskatchewan Education's Evergreen Curriculum, access to technical support, and completion of inservice on using computers in instruction.

When determining the instrument to use to assess the computer attitudes of teachers, two fundamental things had to be considered. First, although numerous studies

have been done to assess the attitude of pre-service and in-service teachers towards computers in general, the significance of this study was that it also examined the attitudes of teachers towards using computers in the classroom. Therefore, it needed to assess educational computer attitudes. Second, this researcher's experience working with teachers for many years indicates that teachers are more likely to respond to a survey if it is short. In order to ensure a good response rate, the survey needed to be short, yet valid and reliable. Extensive care was given to the selection and wording of the questions.

The instrument of choice described in the research literature for assessing computer attitudes has overwhelmingly been the *Computer Attitude Scale* developed by Loyd and Gressard (1984a). Many studies were found that used this, or some modification of this instrument (Koohang , 1987, Delcourt & Kinzie, 1993, Necessary & Parish , 1996, Zoller & Ben-Chaim, 1996, Zhang & Espinoza, 1998, Mitra, 1998). For the purpose of this study, a modified version of Loyd and Gressard's instrument was used. The significant modification was the inclusion of items that assess the subjects' attitudes towards computers with respect to the educational environment as well as modifications that reflect the current level of technological sophistication. In addition, the number of questions was reduced.

Extensive research has been done on assessing the attitude that people have towards computers (Pope, Davis and Twing, 1991, Woodrow, 1991, Nash and Moroz, 1997a). The majority of this research has focused on post-secondary students as subjects, and primarily within this group, education students have been utilized the most (Koohang, 1987, Kim, 1994,

Lau and Ang, 1998). A number of studies focused on assessing the attitude that practicing teachers have towards computers (Kluever et al., 1994, Metu, 1994). Although these studies have value in assessing the overall computer attitude that teachers have towards computers, they offer little in the way of assessing the specific educational attitude towards computers. This study assesses teachers' educational computer attitudes by employing a modified version of Loyd and Gressard's (1984a) *Computer Attitude Scale* using ideas based on the work of Kay (1993) and Francis (1993). The survey has been modified to include teacher specific questions. The number of questions was dropped from the original thirty to fifteen general computer attitude questions and nine "teacher specific" attitude questions. Questions deemed no longer to be relevant due to obsolescent technology were removed. Table1 shows the matrix of questions; five in each of the sub-categories of anxiety, liking and confidence, in the "general computer attitude" category, and three questions of each of the sub categories in the "education related" category. For this portion of the survey, a twenty-four item 5-point Likert scale was used. Questions were equally distributed with respect to the three sub-categories of computer anxiety, computer confidence and computer liking. In addition, three questions in each of the three sub-categories deal with the aspect of teaching and the educational system. Weighting of the questions ranges from 1=strongly disagree to 5=strongly agree. Question that were worded in the negative (marked with an asterisk) were reverse scored (i.e. 1=strongly agree to 5=strongly disagree). This was done so that a higher score in each category would indicate a lower level of anxiety, higher level of confidence and a higher level of likablity. These modifications, removal of some questions and

inclusion of others, will nullify the original reliability estimates determined by Loyd and Gressard. Alphas were determined for the new instrument.

Table 3.1

Computer Attitude Assessment Instrument (Question Matrix)

	Attitude Sub-Category		
	Anxiety	**Confidence**	**Liking**
General	* Computers are gaining too much control over my life	* I feel insecure about my computer ability	I enjoy working with computers
	I am helpless when selecting a computer or software on my own	I am capable of learning computer skills on my own	I would like to learn more about computers
	Generally, I feel ok about trying something new on a computer.	* The challenge of solving problems with computers does not appeal to me.	Overall, computers have more disadvantages than advantages.
	* Computers make me feel uneasy and confused.	* I am not the type to do well with computers.	Figuring out computer problems does not appeal to me.
	I do not feel threatened when others talk about computers.	Anything that a computer can be used for, I can do just as well some other way.	Once I start to work with the computer, I find it hard to stop
Educational	* I get nervous when I think about how I will use computers in my classroom	I am capable of integrating the use of computers into instruction.	The thought of teaching kids using computers appeals to me.
	*Using computers as a teaching tool puts too much additional work on teachers.	Computers can be a useful instructional aide in many subject areas	I want to teach in a school that doesn't put a big emphasis on the use of computers.
	I look forward to using computers with my students.	I have a lot of self confidence when it comes to working with computers in the classroom.	* I do not enjoy talking to other educators about computers

Note. Negative responses are marked with "*". These questions are reverse scored.

Similarly, the common approach to research on computer abilities, skills, competencies or numerous similar terms, is primarily generic in nature, and until very recently, not specific to educators. Kay's (1993) study comes closest to being educator specific, however, the skills that it surveys (emphasis on programming) are dated, and in some cases, irrelevant.

Sheffler and Logan (1999) compiled a comprehensive assessment of competencies relevant to teachers. They have also gone through an extensive process to rank the competencies in order of importance as determined by educators. By dividing the competencies into the sub-groups of "General Competencies" and "Teacher Competencies Unique to Education", we are able to extract the competencies important for educators. This study uses an instrument derived from the top 24 competencies identified by Sheffler and Logan to assess the educational computer ability of teachers. Table 2 shows the questions in each of the two categories. In this survey, subjects are asked to determine their ability in each of the 24 competencies. Response choices are none, minimal, average, advanced and exceptional. The definition for each of the terms is given in the survey. Weighting of the scores was none=0, minimal=1, average=2, advance=3, exceptional=4. The higher the numeric value returned for a question, the higher the level of ability.

Table 3.2

Computer Ability Assessment Instrument (Question Matrix)

General Competencies
Ability to assemble components of a computer system for instructional use.
Ability to use a word processor.
Ability to use operating system software.
Ability to use computers in classroom management.
Ability to use a database program to maintain student records and resource files.
Ability to use presentation software to create lessons.
Ability to use computer information resources.
Ability to utilize network resources such as the internet to conduct research and communicate ideas.
Ability to use e-mail as a personal and professional tool.
Competencies Unique to Education
Ability to use software to facilitate instruction
Ability to evaluate software for instructional purposes.
Ability to plan methods to integrate computer awareness and literacy into the curriculum.
Ability to develop a plan for using computers within instruction.
Ability to develop lesson plans using computers in instruction.
Ability to assess students needs for specific computer-based instruction applications.
Ability to develop a plan to integrate computers into the learning environment.
Ability to differentiate among instructional computer applications such as drill and practice, tutorial, simulation and problem solving.
Ability to demonstrate appropriate use of computer technology for basic skills instruction.
Ability to plan effective pre and post computer interaction activities for students.
Ability to implement a plan to integrate computers into curricula.
Ability to identify, evaluate, select and develop instructional materials for specific learning situations using computers.
Ability to use computers to help students develop higher-order thinking skills.
Ability to use the computer for instruction.
Ability to use computer courseware to individualize instruction.
Ability to evaluate/modify applications of computer instruction in curricula as needed.
Ability to integrate, where appropriate, computer applications in a variety of subject content areas, in a variety of teaching and learning strategies.
Ability to demonstrate how to use computerized simulations of real life as a teaching tool.
Ability to evaluate the effectiveness of computer based instruction on student achievement.
Ability to demonstrate ways to integrate the use of computer related materials with non-computer materials, including manipulative.

This study examines three variables of student computer usage: the overall frequency of student computer use, the frequency of specific types of computer activities and the use of computers in subject areas. The instrument used by Saskatchewan Education in the Provincial Learning Assessment in Technological Literacy (1999) will be utilized. This is done in order to maintain consistency, since as stated at the outset, the premise upon which this study is based is that students are not achieving the standards established by Saskatchewan Education. In order to determine if the computer attitude and ability of teachers is related to this claim, the same method of measuring these variables will to be followed.

To determine the overall frequency of student computer use, teachers were asked to indicate the amount of time a typical student in their class would spend on a computer. Six responses were possible ranging from zero minutes to more than four hours per week. Responses are weighted so that zero minutes = 0, less than thirty minutes =1, >30 minutes but <1 hour = 2, >1 but < 2=3, >2 but <4=4, and 4 hours = 5. A higher numeric value indicates a higher level of usage.

To determine the frequency of specific types of computer use, teachers were asked to select from the responses of none, seldom, often and almost always, for each of 13 types of applications (keyboarding, Internet for research, word processing, e-mail, graphics and animation, spreadsheets, non-educational games, educational games, programming, web page design, multimedia, databases and subject specific software). Responses were rated never=0, seldom=1, often=2, and almost always=3. A higher numeric value would indicate a higher level of frequency for a specific type of activity.

To determine the use of computers in curriculum subject areas, two separate series of questions were asked. The first probes the use of computer internet use in subject areas and the second examines the use of non-internet computer software. Both series of questions follow the same format. Respondents are asked to choose from three responses (yes, no or don't teach this subject) for each of the seven subject areas listed (language arts, mathematics, social studies, health/wellness, arts education. and phys. ed.)

3.2.3 Pre-testing the Instrument

All researchers encourage some form of pre-testing of an instrument prior to its implementation. The initial draft of The Teachers Computer Survey was distributed to an expert group consisting of one high school teacher, one elementary school teacher, a principal, a Director of Education, an educational computer consultant and a desktop publishing specialist. Changes were suggested and revisions in the wording of the questions, instructions and design were suggested and incorporated. A suggestion was made to survey two additional environmental variables. These variables were, 1) familiarity with Saskatchewan Education's Evergreen Curriculum and 2) inservice on using computers in instruction.

The revised draft was presented to a group of pilot teachers (N = 18), representing six schools and eight grade levels. Minor revisions (primarily editorial) were suggested. Some were accepted and incorporated into the final version of the survey.

3.2.4 Validity

Validity is defined as "the appropriateness, meaningfulness, and usefulness of specific inferences made from test scores" (Gall, Borg & Gall, 1996, p.773). Of the four possible procedures that are available to estimate the validity of a test instrument, this study uses the two procedures of concurrent and content validity.

Concurrent validity is defined as "the extent to which individual scores on a new test correspond to their scores on an established test of the same construct that is administered shortly before or after the new test." (Gall, Borg and Gall, 1996, p.252) Although The Teachers Computer Survey has never been utilized in its entirety prior to this study, parts of it have been derived from other studies that have been utilized. Part B, the *Computer Attitude Scale* is modeled after studies by Loyd & Gressard, (1984a), Kay (1993) and Francis (1993). Part C, the *Computer Ability Scale* is derived from the work of Sheffler and Logan (1996), who relied extensively on the opinion of a large expert panel. The student usage assessment in Part D parallels previous studies by Saskatchewan Education (2001).

Content validity refers to the extent that the instrument design accurately represents, or is representative of, the concept that it claims to measure (Gall, Borg and Gall, 1996). It is argued that the claim of content validity is justified because of the involvement of educational professionals, advisory groups, and the pilot study group. All of these people were requested to review the survey and provide feedback.

3.2.5 Reliability

Any study that intends to receive acceptance from the academic community must be reliable. Reliability is defined as the "extent to which other researchers could arrive at similar results if they studied the same case using the same procedures" (Gall, Borg and Gall, 1996, p.786).

Cronbach's Alpha is a general method used to determine the reliability of a test instrument, especially when the test instrument has several possible answers. (Gall, Borg & Gall, 257). Cronbach's Alpha, (internal consistency) was determined for Parts B, the *Attitude Assessment Instrument*, upon completion of its administration. The estimate for internal consistency of the *Attitude Assessment Instrument* was 0.84. The breakdown into the three sub-categories of anxiety, confidence and liking returned alphas of .84, .85 and .78 respectively. Cronbach's Alpha was also determined for Part C, the *Ability Assessment Instrument*. In the sub-category of General Computer Competencies, the alpha was estimated to be .95. In the sub-category of Computer Competencies Unique to Education, the alpha was determined to be .98. The overall internal consistency was estimated at .98.

Generally, co-efficient in the 0.70 range and higher are considered acceptable levels of internal consistency. The results indicate that both *the Attitude Assessment Instrument* and the *Ability Assessment Instrumen*t would be considered reliable.

3.3 Methods of Data Collection

Prior to the commencement of this study, permission was requested from the three provincial boards of education, and two tribal councils in the Northern Administrative

District of Saskatchewan. An outline of the proposed study was presented to senior administrators of each respective authority and permission was granted to have their teachers participate in the study. Application was made to the Advisory Committee on Ethics in Behavioral Science Research of the University of Saskatchewan to proceed with the study. Permission was granted. An expert group was assembled consisting of one high school teacher, one elementary school teacher, a principal, a Director of Education, an educational computer consultant and a desktop publishing specialist. A pilot group of teachers (N = 18), representing six schools and eight grade levels was selected from the population and was brought together in a central location to complete the pilot survey. After receiving feedback from the pilot group and the expert group, revisions to the survey were made. The final version of the survey was administered in early March 2002. A sufficient number of questionnaires for each teacher was sent to the principal to give to each teacher involved in the study. A letter to the principal describing the procedures to be followed for administering the survey, as well as a self addressed stamped envelope was included for an easy return of the completed surveys. A cover letter detailing the study as well as describing the teacher's right of refusal and assurances of confidentiality was included with each survey. Teachers were asked to return the survey within two weeks. A week prior to the two-week deadline, a reminder fax was sent to all schools asking teachers if they had not yet completed the survey that they do so. Taking into account the difficulty in moving mail around remote northern Saskatchewan communities, responses were accepted up to two weeks past the deadline. In addition, those who wished to do so could fax their responses. A total of 165 responses were received.

The last section of the survey asked teachers to volunteer for a follow up interview session. Twelve teachers volunteered to participate in the follow up interview session. The twelve respondents were mailed a one-page questionnaire consisting of five open-ended questions. Subjects were asked to either arrange a face-to-face interview session or respond in writing. Five of twelve subjects responded, with all five opting to write their answers and forward them by fax and e-mail. An analysis of teachers' comments was performed to determine if any notable themes emerged. The results are presented in Chapter 5. Face to face interviews were not undertaken and so were unable to be incorporated into this study. The interview guide, as requested by the Advisory Committee on Ethics in Behavioral Science Research of the University of Saskatchewan, did not need to be used.

3.4 Analysis of Data

Data from Part A were summarized to provide an overview of demographic and environmental information. Frequencies were determined for each of the variables. ANOVAs were used to determine the extent to which significant differences existed between the frequency of student computer use and demographic and environmental variables.

Part B and C assessed teachers' computer attitude and computer ability by utilizing Likert scale responses, which required an item analysis to determine scale reliability levels. After compensating for negative scored questions, total scores were determined. Higher scores would indicate a higher ability level and more positive attitude.

Part D assessed student computer use in three areas. It examined the overall frequency of student computer use, the frequency of specific types of computer use and the use of computers in subject areas. Part E allowed for teachers to provide support information through an interview or written submission process. All responses in part E were in written form. Interview sessions did not occur.

Statistical analysis of the data was performed using SPSS (version 10) computer software. Data were initially compiled in Microsoft Access and exported to SPSS for analysis.

3.5 Ethical Considerations

Prior to the implementation of the survey, application was made to the Advisory Committee on Ethics in Behavioral Science Research of the University of Saskatchewan, Approval was granted pending minor revisions (see appendix). The original request to the committee contained provisions for face to face interviews and required the development of an Interview Guide. Since the face to face interview portion of this study was dropped do to non-participation, the development of the interview guide and subsequent submission for approval was not required.

3.6 Summary of Research Methods and Contribution of the Study

In this chapter, the strategy for completing the study was described. The sample (in this case the entire target population) consisted of 525 teachers in 48 provincial and First Nation schools in Northern Saskatchewan. A questionnaire entitled the Teachers Computer

Survey was designed to collect the data. The instrument was reviewed by an expert panel and a pilot group was commissioned. Tests for reliability and validity were conducted. Data collection procedures were designed to compensate for the challenges involved in administering a survey in a large geographic area. Chapter Four examines the data results while Chapter Five summarizes the results, discusses the implications of the study, and gives suggestions for further research.

Chapter Four

ANALYSIS OF DATA

4.1 Research Findings

The purpose of this study was to examine the relationship between the attitude and ability of teachers and the computer use of students in northern Saskatchewan schools. The survey that was administered, The Teachers Computer Survey, collected demographic and environmental data on teachers, data on attitude and self assessed computer ability, and data on the frequency and type of computer use by students. This chapter will first provide a summary of the data collected. Chapter Five will provided an examination of each of the research questions posed in Chapter 1.

4.2 Demographic Data

The survey was sent to 525 teachers (the entire target population) in the Northern Administrative District of the Province of Saskatchewan. This represented all teachers employed in 28 provincial and 20 First Nation schools. Surveys were administered in early March 2002 and the results were analyzed during the summer and fall of 2002. In total, 165 of the surveys were completed and returned. This represented 31 % of the population under study. Although the percentage of returns was not as high as was hoped, sufficient data were collected to warrant analysis. Table 4.1 shows the demographic profile of the sample.

Of the respondents, 60.2% were female and 38.6% were male. The number of teachers in the three age categories of 21-30, 31-40, and 41-50 years old were similar with 24.7%, 25.9% and 27.7% respectively. Slightly more than 15% fell into the 51- 60 age group and 3 % were over 60. Closely paralleling age was teaching experience. Slightly more than one half (53%) of the teachers had less than 10 years of experience, 24.7% had 10 – 20 years of experience and 18.7% had more than 20 years of experience.

4.3 Environmental Data

Seven environmental variables were queried by the survey: personal computer usage; access to a computer at home; access to the internet at home; use of e-mail; awareness of Saskatchewan Education's Evergreen Curriculum; access to technical support; and completion of inservice on using computers in instruction; Overall, 79.5% of teachers had access to a computer at home. Although nearly 80% of respondents have access to a computer at home, only 66.3% have access to the Internet at home. 85% have access to and utilize e-mail. Saskatchewan Education's Evergreen Curriculum is familiar to 87.3% of responding teachers. 63.3% have access to technical support in their school and 63.3% report having received inservice on using computers in instruction. The results are summarized in Table 4.1.

Table 4.1

Demographic Description of Responding Teachers (N=165)

Demographic Variables	N	(%)
A. Gender		
Male	64	38.6
Female	100	60.2
B. Age		
21-30	41	24.7
31-40	43	25.9
41-50	46	27.7
51-60	25	15.1
over 60	5	3.0
C. Teaching Experience		
Less than 1 year	13	7.8
1-5 years	44	26.5
6-10 years	31	18.7
11-20 years	41	24.7
more than 20 years	31	18.7

Table 4.2

Environmental Description of Responding Teachers (n=165)

Environmental variables	N	(%)
Do you have access to a personal computer at home?		
Yes	132	79.5
No	33	19.9
Do you have access to the internet at home?		
Yes	110	66.3
No	55	33.1
Do you have and use an e-mail account?		
Yes	141	84.9
No	24	14.5
Are you familiar with Saskatchewan Educations' Evergreen Curriculum?	145	87.3
Yes	20	12.0
No		
Does your school have a technical support person?		
Yes	117	70.5
No	48	28.9
Have you received inservice on using computers in instruction?	105	63.3
Yes	60	36.1
No		

4.4 Attitude and Ability Assessment Data

To assess the attitude of teachers toward computers as well as assessing their computer ability, two instruments, the *Computer Attitude Scale* and the *Computer Ability Scale* were used. Reliability of both scales was determined using Cronbach's Alpha.

The overall estimate for internal consistency of the *Computer Attitude Scale* was 0.84. When broken down further into the three sub-categories of anxiety, confidence and liking, the Alphas were estimated to be .84, .85, and .78 respectively.

The overall estimate for internal consistency of the *Computer Ability Scale* was .98, with sub-category estimates of .95 in "general computer competencies" and .98 in "computer competencies unique to teaching".

The overall sample means and standard deviations for the *Computer Attitude Scale* and *Computer Ability Scale* are presented in Table 5. The overall mean score on the *Computer Attitude Scale* was 2.74, which, on a scale that ranged between 0 (negative) and 4 (positive) indicated an overall positive attitude toward the use of computers. The overall mean score on the *Computer Ability Scale* was 1.73. This scale ranged from 0 (no ability) to 4 (exceptional ability). The results indicated that overall, teachers would assess their computer ability as below average.

Table 4.3

Overall Means on the Computer Attitude Scale and the Computer Ability Scale

Variable	Mean	SD	N
Computer Attitude Scale	2.74	0.61	165
Computer Ability Scale	1.73	.93	165

4.5 Student Usage Data

The Teachers Computer Survey examined student computer use in three areas; the overall frequency of student computer use; the frequency of specific types of computer use; and the use of computers in different subject areas.

The mean score for the overall frequency of student computer use was 2.62, with a standard deviation of 1.23. This indicates an average overall frequency of between 30 minutes and two hours per six day school week. Teachers responded that nearly 13% of students spend less than 30 minutes per week on a computer with more than half of that group receiving no time at all. Substantially more than half (62%) spend between thirty minutes to two hours per week on a computer. Nearly one quarter of the teachers polled said their students spend more than two hours per week on a computer, and 5.8% said their students spend more than 4 hours per week on a computer. (See Table 6)

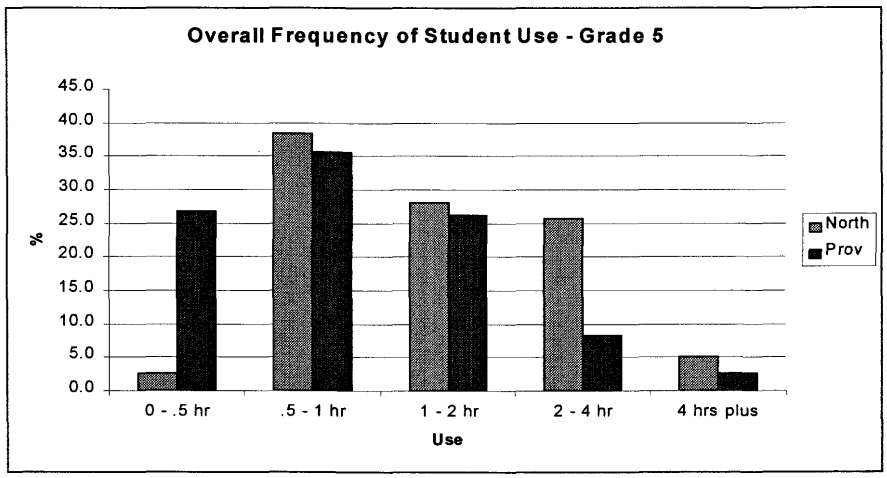
Table 4.4

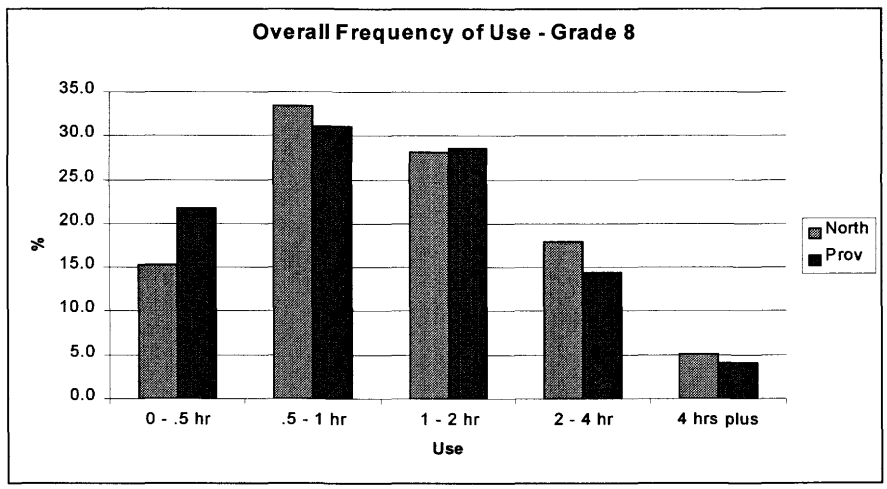
Frequency of Student Computer Use (Per six day school week)

Time Spent on Computer (per six day school	Frequency	%
0	11	7.1
Less than 30 minutes	9	5.8
More than 30 minutes but less than 1 hour	55	35.7
More than one hour but less than 2 hours	41	26.6
More than 2 hours but less than 4 hours	29	18.8
More than 4 hours	9	5.8
Total Responses	154	100.0

When extracting the grade 5, 8 and 11 student data from this study and comparing the results to those of the Saskatchewan Education (2001) study, the overall distribution is similar (see Figure 1). The north has fewer students in the "least use" category, but more in two of the three grades "most used category."

To determine the frequency of specific types of computer use by students, teachers were asked to respond by selecting one of never, seldom, often or almost-always for each of thirteen activity types queried. Table 7 summarizes the findings. When combining the results of almost always and often, keyboarding is the predominant activity of students (69%) followed closely by educational games (61%). Word processing, Internet for research and non-educational games are the only other three activities that occur either often or almost always more than one half the time at 52%, 51% and 50% respectively.





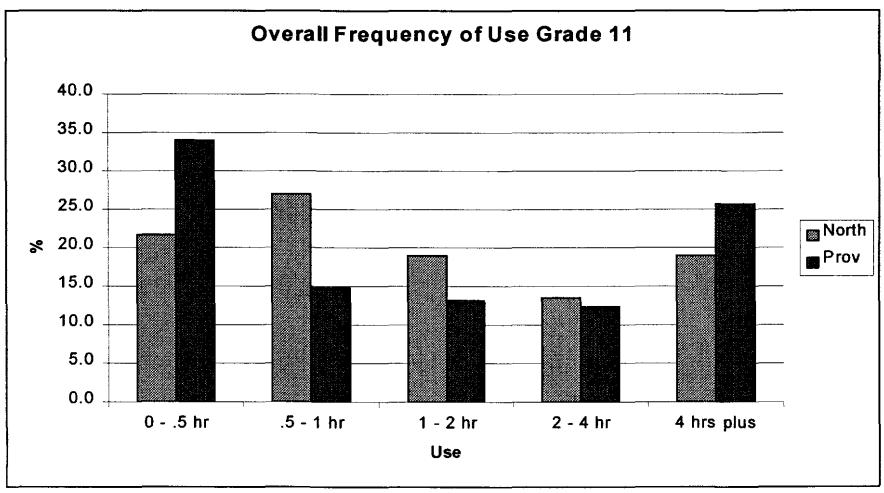


Figure 4.1

Overall Frequency of Student Computer Use Grades 5, 8 & 11.

Table 4.5

Frequency of Specific Types of Computer Activity

Type of Activity	Never (%)	Seldom (%)	Often (%)	Almost Always (%)
Keyboarding	0.1	31.3	46.9	21.6
Internet for Research	23.2	25.2	40.0	11.6
Word Processing	22.1	26.0	39.6	12.3
E-Mail	52.3	20.5	21.2	6.0
Graphics and Animation	49.7	27.5	20.3	2.6
Spreadsheets	71.2	22.2	5.9	0.7
Games (non-educational)	16.9	33.8	37.0	12.3
Games (educational)	15.7	24.2	45.1	15.0
Programming	76.0	20.0	3.3	0.7
Web Page Design	73.7	0.7	19.7	5.9
Multimedia Production	62.5	28.9	7.9	0.7
Databases	72.0	23.3	4.7	0.0
Subject Specific Software	47.4	34.2	13.2	5.3

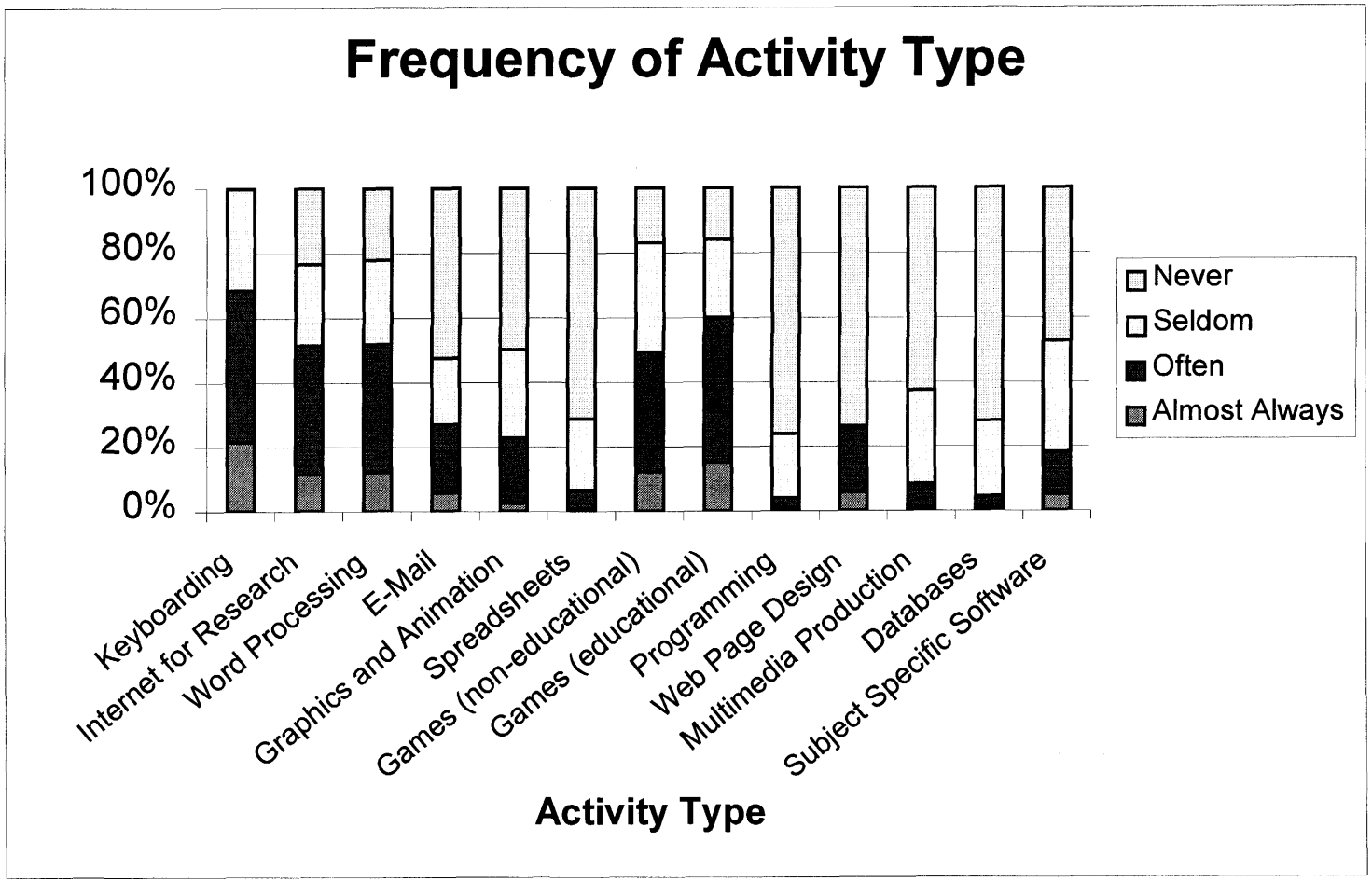


Figure 4.2

Frequency of Student Computer Activity (Per six day school week)

The third area of student use examined in the Teacher Computer Survey asked teachers to indicate if their students had used computers in seven different subject areas. This question was further broken down into the two sub-categories of "Internet use of computers" and "non-Internet use of computers" (Table 4.6)

Language arts received the highest overall use rate with 67.7 % of teachers claiming attempted internet use, and 78.7% success in non-internet use of computers in that subject. Math received the second highest overall ranking, however a substantial gap between internet and non-internet use was evident (39.7 % compared to 71.1% respectively). Nearly half of teachers indicated success in science and social studies with science receiving more success in Internet usage than non-internet use. Between one quarter and one third of teachers indicated some use in health/wellness and arts education, with very few teachers, (6.1 % internet and 1.2 % non-internet) indicating use in the phys. ed area.

When comparing the results of this study to the provincial study, the north showed a higher Internet use in almost all subject areas. The results were not nearly as stark when examining the non-Internet use of computers in subject areas. The northern results were lower in science, health/wellness and arts education (See Table 4.7 and Table 4.8).

Table 4.6

Use of Computers in Subject Areas

	Internet Use of Computers		Non-Internet Use of Computers	
Subject Area	Yes (%)	No (%)	Yes (%)	No (%)
Language Arts	67.7	32.3	78.7	21.3
Math	39.7	60.3	71.1	28.9
Science	55.6	44.4	47.4	52.6
Social Studies	60.3	39.7	45.0	55.0
Health/Wellness	31.4	68.6	21.8	78.2
Arts Education	16.5	83.5	22.1	77.9
Phys. Ed	6.1	93.9	1.2	98.8

Table 4.7

Comparison of Provincial and Northern Internet Computer Use of Students in Subject Areas.

	Grade 5 (%)		Grade 8 (%)		Grade 11 (%)	
	North	Prov.	North	Prov.	North	Prov.
Language Arts	94	24	71	34	83	48
Math	45	10	48	6	50	3
Social Studies	72	40	73	52	88	52
Science	83	28	86	35	88	40
Arts Ed	44	9	62	13	86	11
Health/Wellness	17	13	17	19	80	12
Phys Ed	15	8	16	6	67	10

Table 4.8

Comparison of Provincial and Northern Non-internet Computer Use of Students in Subject Areas.

	Grade 5 (%)		Grade 8 (%)		Grade 11 (%)	
	North	Prov	North	Prov	North	Prov
Language Arts	99	55	74	62	79	53
Math	81	48	67	50	74	45
Social Studies	57	41	33	47	71	44
Science	60	38	36	42	50	40
Arts Ed	30	40	23	46	50	39
Health/Wellness	27	36	17	43	50	37
Phys Ed	5	41	5	49	0	41

4.6 Summary

This chapter presents the overall results of the data collected. The survey that was administered, The Teachers Computer Survey, collected demographic and environmental data on teachers, data on attitude and self assessed computer ability, and data on the frequency and type of computer use by students. Chapter Five will provided an examination of each of the research questions posed in Chapter 1.

Chapter Five

DISCUSSION OF STUDENT EXPERIENCES

5.1 Introduction

This chapter examines each research question in the study individually, within the context of the three groupings of student usage (overall frequency of use, frequency of specific type of computer use and frequency of student use in specific subject areas). For each question, a null hypothesis was formulated, posed and then tested. The responses to each of the questions follow.

5.2 Overall Frequency of Student Computer Use

5.2.1 Survey Question #1: Does a relationship exist between teachers' attitude towards computers and the overall frequency of computer use by students?

To answer this question, the null hypothesis tested was: teachers' attitude towards computers does not correlate with the overall frequency of computer use by students. To test this hypothesis, a Pearson Product-Moment Correlation Coefficient test was conducted between scores on the *Computer Attitude Scale* and the overall frequency of student use. The result, as presented in Table 5.1, was .140. This correlation is not significant at the 0.05 level and therefore the null hypothesis is accepted. This study did not find a relationship between teachers' attitude towards computers and the overall frequency of student computer use.

Table 5.1

Correlation between Computer Attitude of Teachers and Overall Frequency of Student Computer Use

	Attitude	Frequency of Use
Attitude		
Pearson Correlation	1.000	.140
Sig. (2 – Tailed)		.083
N	165	154
Frequency of Use		
Pearson Correlation	.140	1.000
Sig. (2 – Tailed)	.083	
N	154	154

5.2.2 Survey Question #2: Does a relationship exist between teachers' computer ability and the overall frequency of student computer use?

The null hypothesis formulated and tested to answer this question was: teachers' computer ability does not correlate with the overall frequency of student computer use. A Pearson Product-Moment Correlation Coefficient test was conducted between scores on the *Computer Ability Scale* and the overall frequency of student computer use. The result (see Table 5.2) was .117. This correlation is not significant at the 0.05 level and therefore the null hypothesis is accepted. This study did not find a relationship between teachers' computer ability and the overall frequency of student computer use.

Table 5.2

Correlation between Teacher Computer Ability and the Overall Frequency of Student Computer Use

	Ability	Frequency of Use
Ability		
Pearson Correlation	1.000	.117
Sig. (2 – Tailed)		.154
N	161	150
Frequency of Use		
Pearson Correlation	.117	1.000
Sig. (2 – Tailed)	.154	
N	150	154

5.2.3 Survey Question # 3: Does a relationship exist between the demographic variables of teachers (gender, age, teaching experience) and the overall frequency of computer use by students?

The null hypothesis tested was that a relationship does not exist between the demographic variables of teachers (gender, age, teaching experience) and the overall frequency of computer use by students. A one-way analysis of variance (ANOVA) was conducted to determine the extent to which significant differences existed among the categories of gender, age, teaching experience and the frequency of student use (see Table 5.3). In reviewing the results, no significant differences in means existed between any of the three demographic variables and frequency of student use. Therefore, the null hypothesis is accepted. In this study, a relationship

between the demographic variables of age, gender, teaching experience and the overall frequency of student use was not found.

Table 5.3

ANOVA for Frequency of Student Use vs. Teacher Demographic Variables

Source	df	Mean Square	F	Sig.
Gender				
Between Groups	5	.237	1.001	.419
Within Groups	148	.236		
Total	153			
Age				
Between Groups	5	1.219	.975	.435
Within Groups	144	1.251		
Total	149			
Teaching experience				
Between Groups	5	1.072	.660	.654
Within Groups	144	1.624		
Total	149			

5.2.4 Survey Question # 4: Does a relationship exist between the environmental variables of teachers (personal computer usage; computer at home; access to the internet at home; use of e-mail; awareness of Saskatchewan

Education's Evergreen Curriculum; access to technical support; and completion of inservice) and the overall frequency of computer use by students?

The null hypothesis formulated to answer this question was; a relationship does not exist between environmental variables (computer usage, computer at home, access to the internet at home, use of e-mail, awareness of Saskatchewan Education's Evergreen Curriculum, access to technical support, and inservice) and the overall frequency of computer use by students. A one-way analysis of variance (ANOVA) was conducted to determine the extent to which significant differences existed among the seven categories and the overall frequency of student use (see Table 5.4). The results showed that no significant differences in means existed between any of the seven environmental variables and the frequency of student use. Therefore, the null hypothesis is accepted. In this study, a relationship between the environmental variables of computer usage, computer at home, access to the internet at home, use of e-mail, awareness of Saskatchewan Education's Evergreen Curriculum, access to technical support, and inservice) and the overall frequency of student use was not found.

Table 5.4

ANOVA for Frequency of Student Use vs. Teacher Environmental Variables

Source	df	Mean Square	F	Sig.
Teacher Use				
Between Groups	5	2.758	1.923	.094
Within Groups	145	1.434		
Total	150			
Computer at Home				
Between Groups	5	.380	2.401	.040
Within Groups	148	.158		
Total	153			
Internet at Home				
Between Groups	5	.404	1.883	.101
Within Groups	148	.215		
Total	153			
Use E-mail				
Between Groups	5	.084	.698	.626
Within Groups	148	.120		
Total	153			
Familiar with Evergreen				
Between Groups	5	.136	1.389	.232
Within Groups	148	.098		
Total	153			
Access to Technical Support				
Between Groups	5	.044	.205	.960
Within Groups	148	.214		
Total	153			
Have taken Inservice				
Between Groups	5	.238	1.030	.402
Within Groups	148	.231		
Total	153			

5.3 Frequency of specific type of Computer Use of Students

5.3.1 Survey Question #5: Does a relationship exist between teachers' attitude towards computers and the frequency of specific types of computer activities by students?

To answer this question, the following null hypothesis was tested; teachers' attitudes toward computers does not correlate with the frequency of any of 13 specific types of computer activities by students.

A Pearson Product-Moment Correlation Coefficient between scores on the *Computer Attitude Scale* and each of the 13 types of activities queried in part D was conducted. A correlation significant at the .05 level were found in 6 of 13 types of activities (keyboarding, Internet for research, word processing, e-mail, spreadsheets and databases). Table 5.5 shows the Pearson Product-Moment Correlation Coefficients between scores on the *Computer Attitude Scale* and each of the 13 types of activities. Since a correlation was found, the null hypothesis is rejected. In answer to the research question, in this study, a relationship does exist between teachers' attitudes toward computers and the frequency of specific types of computer activity by students.

Table 5.5

Correlation between Teachers' Attitude and Ability and the Frequency of Specific Computer Activity of Students.

	Attitude	Ability
Keyboarding		
Pearson Correlation	.249*	.293*
Sig. (2 – Tailed)	.002	.000
N	154	150
Internet for Research		
Pearson Correlation	.316*	.306*
Sig. (2 – Tailed)	.000	.000
N	155	151
Word Processing		
Pearson Correlation	.376*	.465*
Sig. (2 – Tailed)	.000	.000
N	154	154
E-Mail		
Pearson Correlation	.291*	.280*
Sig. (2 – Tailed)	.000	.000
N	151	147
Graphics and Animation		
Pearson Correlation	.071	.167*
Sig. (2 – Tailed)	.384	.042
N	153	149
Spreadsheets		
Pearson Correlation	.293*	.210*
Sig. (2 – Tailed)	.003	.010
N	153	149

Table 5.5 Continued

Correlation between Teachers' Attitude and Ability and the Frequency of Specific Computer Activity of Students.

Games (non-educational)		
Pearson Correlation	.004	-.001
Sig. (2 – Tailed)	.958	.988
N	154	150
Games (educational)		
Pearson Correlation	-.049	-.068
Sig. (2 – Tailed)	.551	.410
N	153	149
Programming		
Pearson Correlation	.039	.082
Sig. (2 – Tailed)	.636	.323
N	150	146
Web Page Design		
Pearson Correlation	.121	.205*
Sig. (2 – Tailed)	.139	.013
N	152	148
Multimedia Production		
Pearson Correlation	.076	.089
Sig. (2 – Tailed)	.355	.281
N	152	148
Databases		
Pearson Correlation	.193*	.302*
Sig. (2 – Tailed)	.018	.000
N	150	146
Subject Specific Software		
Pearson Correlation	.113	.180*
Sig. (2 – Tailed)	.165	.029
N	152	148

* Correlation is significant at the 0.05 level (2-tailed).

5.3.2 Research Question #6: Does a relationship exist between teachers' computer ability and the frequency of specific types of computer activity by students?

The null hypothesis tested to answer this question was the computer ability of teachers does not correlate with the frequency of any of 13 specific types of computer activity by students.

The Pearson Product-Moment Correlation Coefficient between scores on the *Computer Ability Scale* and each of the 13 types of activities was conducted. Correlation significant at the .05 level were found in nine of the 13 types of activities (keyboarding, internet for research, word processing, e-mail, graphics and animation, spreadsheets, web page design, databases and subject specific software). Since a correlation was found, the null hypothesis is rejected. Table 5.6 shows the Pearson Product-Moment Correlation Coefficients between scores on the *Computer Ability Scale* and each of the 13 types of activities queried. The response to the research question posed is, in this study a relationship does exist between a teachers' computer ability and the frequency of specific types of computer activity by students.

5.3.3 Survey Question # 7: Does a relationship exist between the demographic variables of teachers (gender, age, teaching experience) and the frequency of specific types of computer activity by students?

The null hypothesis tested to answer this question was the demographic variables of teachers (gender, age and teaching experience) does not correlate with the frequency of any of 13 specific types of computer activity by students. A Pearson Product-Moment Correlation Coefficient between the 3 demographic variables and each of the 13 specific types of activities was conducted. Correlation significant at the .05 level was found in four instances (gender and internet usage, gender and e-mail usage, age and spreadsheet use, experience and spreadsheet use, and databases and experience. Table5.7 illustrates these correlations. Since a correlation was found, the null hypothesis is rejected and the response to the research question is, in this study a relationship between the demographic variables of teachers and the frequency of specific types of computer use by students does exist.

5.3.4 Survey Question #8: Does a relationship exist between the environmental variables of teachers (personal computer usage; computer at home; access to the internet at home; use of e-mail; awareness of Saskatchewan Education's Evergreen Curriculum; access to technical support; completion of inservice) and the frequency of specific types of computer activity by students?

The following null hypothesis was tested: A relationship does not exist between the teachers' environmental variables (computer usage, computer at home, access to the internet at home, use of e-mail, awareness of Saskatchewan

Education's Evergreen Curriculum, access to technical support, and completion of inservice) and the frequency of specific types of computer activity by students. A Pearson Product-Moment Correlation Coefficient between the seven environmental variables and each of the 13 types of activities was conducted. Correlation significant at the .05 level were found in four instances (keyboarding and teacher usage, non-educational games and access to technical support, educational games and a computer at home, and multimedia and completion of inservice). A correlation significant at the .01 level was found in nine cases. Table 5.8 illustrates the correlation. Since a correlation was found, the null hypothesis is rejected. The response to the research question is, in this study a relationship does exist between teachers' environmental variables and the frequency of specific types of computer activity by students.

5.4 Computer Use of Students in Specific Subject Areas

5.4.1 Survey Question # 9

Does a relationship exist between teachers' computer attitude and the use of computers in specific subject areas?

The null hypothesis tested was that a relationship does not exist between teachers' computer attitude and the use of computers in any of seven specific subject areas. An ANOVA was conducted to determine the extent to which a significant difference existed between teachers computer attitude and both the

Internet use of computers and non-internet use of computers in seven different subject areas. Analysis showed that a significant difference was found in six of seven subject areas (language arts, social studies, science, health, arts education and phys. ed.) in the Internet use of computers category (Table 5.8). A Pearson Correlation test revealed the same results with all subjects, except math, demonstrating a significant relationship (Table 5.10).

When examining the non-Internet use of computers in specific subject areas, the result was different. As seen in Table 5.9, an ANOVA revealed only one subject area (Arts Education) as having a significant relationship. A Pearson Correlation yielded the same result. (Table 5.11)

Since a significant relationship was found, the null hypothesis is rejected. In this study, a significant relationship was found to exist between teachers' computer attitude and the use of computers in specific subject areas

Table 5.8

ANOVA of Attitude of Teachers vs. Internet Use of Computers in Subject Area.

Language Arts					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	4.188	1	4.188	12.753	0.001
Within Groups	41.049	125	0.328		
Total	45.237	126			
Math					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	0.556	1	0.556	1.412	0.237
Within Groups	46.889	119	0.394		
Total	47.445	120			
Social Studies					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	4.315	1	4.315	12.917	0
Within Groups	38.412	115	0.334		
Total	42.727	116			

Table 5.8 Continued

ANOVA of Attitude of Teachers vs. Internet Use of Computers in Subject Area.

Science					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	4.972	1	4.972	14.311	0
Within Groups	39.61	114	0.347		
Total	44.582	115			
Health/Wellness					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	3.883	1	3.883	11.149	0.001
Within Groups	34.833	100	0.348		
Total	38.716	101			
Arts Education					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	4.08	1	4.08	13.112	0
Within Groups	31.431	101	0.311		
Total	35.511	102			
Phys Ed.					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2.164	1	2.164	6.084	0.016
Within Groups	28.457	80	0.356		
Total	30.621	81			

Table 5.9

ANOVA of Attitude of Teachers vs. Non-Internet Use of Computers in Subject Area.

Language Arts	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	0.186	1	0.186	0.534	0.467
Within Groups	41.785	120	0.348		
Total	41.971	121			
Math	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.082	1	.086	0.208	0.649
Within Groups	47.328	119	0.398		
Total	47.411	120			
Social Studies	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.176	1	1.176	3.224	0.075
Within Groups	41.571	114	0.365		
Total	42.746	115			
Science	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.042	1	.042	0.112	0.738
Within Groups	41.222	109	0.378		
Total	41.264	110			
Health/Wellness	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	0.953	1	0.953	2.638	0.108
Within Groups	35.776	99	0.361		
Total	36.73	100			
Arts Education	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.604	1	1.604	4.847	0.03
Within Groups	33.757	102	0.331		
Total	35.361	103			
Phys Ed.					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	0.785	1	0.785	2.241	0.138
Within Groups	28.388	81	0.35		
Total	29.174	82			

Table 5.10

Correlation of Computer Attitude and Ability of Teachers vs. Internet Use of Computers in Subject Area

		Computer Attitude	Computer Ability
Language Arts			
	Pearson Correlation	.304(**)	.354(**)
	Sig. (2-tailed)	0.001	0
	N	127	122
Math			
	Pearson Correlation	0.108	0.174
	Sig. (2-tailed)	0.237	0.059
	N	121	118
Science			
	Pearson Correlation	.318(**)	.340(**)
	Sig. (2-tailed)	0	0
	N	117	114
Social Studies			
	Pearson Correlation	.334(**)	.437(**)
	Sig. (2-tailed)	0	0
	N	116	113
Health/Wellness			
	Pearson Correlation	.317(**)	.219(*)
	Sig. (2-tailed)	0.001	0.029
	N	102	99
Arts Education			
	Pearson Correlation	.339(**)	.288(**)
	Sig. (2-tailed)	0	0.004
	N	103	100
Phys Ed			
	Pearson Correlation	.266(*)	.382(**)
	Sig. (2-tailed)	0.016	0
	N	82	80

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

Table 5.11

Correlation of Computer Attitude and Ability of Teachers vs. Non-Internet Use of Computers in Subject Area.

		Computer Attitude	Computer Ability
Language arts			
	Pearson Correlation	0.067	0.162
	Sig. (2-tailed)	0.467	0.08
	N	122	117
Math			
	Pearson Correlation	-0.042	0.075
	Sig. (2-tailed)	0.649	0.42
	N	121	118
Science			
	Pearson Correlation	0.166	.288(**)
	Sig. (2-tailed)	0.075	0.002
	N	116	113
Social Studies			
	Pearson Correlation	0.032	.202(*)
	Sig. (2-tailed)	0.738	0.036
	N	111	108
Health/Wellness			
	Pearson Correlation	0.161	0.194
	Sig. (2-tailed)	0.108	0.056
	N	101	98
Arts Education			
	Pearson Correlation	.213(*)	.254(*)
	Sig. (2-tailed)	0.03	0.01
	N	104	101
Phys Ed			
	Pearson Correlation	-0.164	-0.068
	Sig. (2-tailed)	0.138	0.548
	N	83	81

** Correlation is significant at the 0.01 level (2-tailed).

5.4.2 Survey Question # 10: Does a relationship exist between teachers' computer ability and the use of computers in specific subject areas?

The null hypothesis tested was that a relationship does not exist between teachers' computer ability and the use of computers in any of seven specific subject areas. An ANOVA was conducted to determine the extent to which a significant difference existed between teachers' computer ability and both the Internet use of computers and non-internet use of computers in seven different subject areas. In six of seven subject areas (language arts, social studies, science, health, arts education and phys. ed.) a significant relationship was found in the Internet use of computers (Table 5.12).

When examining the non-internet use of computers in specific subject areas in relationship to the computer ability of teachers, a somewhat balanced result occurred. As seen in Table 5.13, an ANOVA showed three subject areas (science, social studies and arts education) as having significant relationships.

Since a significant relationship was found, the null hypothesis is rejected. In this study, a significant relationship was found to exist between teachers' computer ability and the use of computers in specific subject areas.

Table 5.12

ANOVA of Ability of Teachers vs. Internet Use of Computers in Subject Area

Language Arts				
	df	Mean Square	F	Sig.
Between Groups	1	10.878	17.162	0
Within Groups	120	0.634		
Total	121			
Math				
	df	Mean Square	F	Sig.
Between Groups	1	2.988	3.624	0.059
Within Groups	116	0.825		
Total	117			
Social Studies				
	df	Mean Square	F	Sig.
Between Groups	1	10.411	14.667	0
Within Groups	112	0.71		
Total	113			
Science				
	df	Mean Square	F	Sig.
Between Groups	1	15.744	26.21	0
Within Groups	111	0.601		
Total	112			
Health				
	df	Mean Square	F	Sig.
Between Groups	1	3.532	4.889	0.029
Within Groups	97	0.722		
Total	98			
Arts Education				
	df	Mean Square	F	Sig.
Between Groups	1	6.319	8.89	0.004
Within Groups	98	0.711		
Total	99			
Phys Ed				
	df	Mean Square	F	Sig.
Between Groups	1	9.836	13.29	0
Within Groups	78	0.74		
Total	79			

Table 5.13

ANOVA of Ability of Teachers vs. Non-Internet Use of Computers in Subject Area

Language Arts				
	df	Mean Square	F	Sig.
Between Groups	1	2.125	3.115	0.08
Within Groups	115	0.682		
Total	116			
Math				
	df	Mean Square	F	Sig.
Between Groups	1	0.563	0.656	0.42
Within Groups	116	0.857		
Total	117			
Social Studies				
	df	Mean Square	F	Sig.
Between Groups	1	7.516	10.02	0.002
Within Groups	111	0.75		
Total	112			
Science				
	df	Mean Square	F	Sig.
Between Groups	1	3.071	4.498	0.036
Within Groups	106	0.683		
Total	107			
Health				
	df	Mean Square	F	Sig.
Between Groups	1	2.757	3.75	0.056
Within Groups	96	0.735		
Total	97			
Arts Education				
	df	Mean Square	F	Sig.
Between Groups	1	4.689	6.845	0.01
Within Groups	99	0.685		
Total	100			
Phys Ed				
	df	Mean Square	F	Sig.
Between Groups	1	0.298	0.365	0.548
Within Groups	79	0.817		
Total	80			

* Correlation is significant at the 0.05 level (2-tailed).

5.4.3 Survey Question #11: Does a relationship exist between the demographic variables of teachers (gender, age, teaching experience) and the use of computers in specific subject areas?

The null hypothesis tested was that a relationship does not exist between the demographic variables of teachers (gender, age, teaching experience) and the internet and non-internet use of computers in specific subject areas. A Pearson Correlation analysis of the internet use of computers (Table 5.14) showed a relationship between gender and four of seven subject areas (language arts, science, social studies and phys ed.). No relationship was found in the other demographic variables. An analysis of the non-internet use of computers and demographic variables showed no significant correlation. (See Table 5.14)

Since a significant relationship was found, the null hypothesis is rejected. In this study, a significant relationship was found to exist between the demographic variables of teachers (gender, age, teaching experience) and the use of computers in specific subject areas.

5.4.4 Survey Question # 12: Does a relationship exist between the environmental variables of teachers (personal computer usage; computer at home; access to the internet at home; use of e-mail; awareness of Saskatchewan Education's Evergreen Curriculum; access to technical support; completion of inservice) and the use of computers in specific subject areas?

The null hypothesis tested was that a relationship does not exist between the environmental variables of teachers (personal computer usage; computer at home; access to the internet at home; use of e-mail; awareness of Saskatchewan Education's Evergreen Curriculum; access to technical support; completion of inservice) and the use of computers in specific subject areas.

In the "Internet use of computers category" a Pearson Correlation analysis revealed a relationship between five of seven environmental variables and one or more subject areas. Arts Education was the only subject area that that showed no relationship to any environmental variable (Table 5.14).

An analysis of the non-internet use of computers and environmental variables showed significant correlation between use of e-mail and Health/Wellness, familiar with Evergreen Curriculum and Arts Ed, and completion of inservice in both subject areas of Math and Science (See Table 5.15).

Since a significant relationship was found, the null hypothesis is rejected. In this study, a significant relationship was found to exist between the environmental variables of teachers (personal computer usage; computer at home; access to the internet at home; use of e-mail; awareness of Saskatchewan Education's Evergreen Curriculum; access to technical support; completion of inservice) and the use of computers in specific subject areas.

5.5 Qualitative Data

The last section of the Teachers Computer Survey asked teachers to participate in a follow-up interview session by providing their name, address and telephone number. Twelve teachers responded. Each was sent a covering letter asking them to arrange a meeting time at their convenience, either by phone, or face to face. At the request of some teachers, the option was given to respond in writing to the discussion questions and forward them by fax or e-mail. Five teachers responded. All chose to provide answers in writing. Though the pool of respondents was small, some common themes emerged. They are described here.

All the respondents felt that the use of computers was a significant element in the teaching and learning process. An Arts Education teacher writes, "My students are of the opinion that computers can help them in their arts education predominantly because it makes it easier to get the look they want in their projects and communicate their ideas visually, I am doing my students a disservice if I keep them in the dark ages." Another teacher's comments seem to echo the premise of this study. He writes, "Students need to do work on basic computer processes every day if we want our northern students to get jobs."

When answering the question, "How does a teacher's attitude towards computers affect the frequency and type of activities offered to students? ", some respondents equated attitude with ability. One person replied, "It (attitude) affects it (frequency) greatly. If a teacher is computer illiterate you can bet a student is not

going to have very much computer time because the teacher won't feel comfortable teaching it." Another states, "If they don't bother to use them, it is not likely they will bother to teach with them."

The connection between a teacher's "comfort level" and computer use was a theme through all the responses. Generally, being comfortable with using computers was a "catch all" to describe a positive attitude and adequate ability level. One teacher writes, "If a teacher is comfortable with computers they are going to take them (their students) to the computer lab and they will be able to help the students."

When asked to detail supports that schools and school divisions could put in place to enhance the use of computers in schools, two themes emerged. First, as one teacher stated so clearly, "we need to get more computers in the hands of students and teachers." Another would like to see, "all the classrooms connected to the school network and the Internet".

The second theme with regards to supports that emerged was for inservice. One teacher wrote, "I would like to take some classes/workshops on computer applications, like Excel, Photoshop and building web pages." Another response took it one step further and relates, "We need a computer curriculum just like any other subject with inservice days. We especially need a basic computer class for all teachers who feel incompetent."

5.6 Summary

This chapter answers each of the twelve survey questions. For each question a null hypothesis was presented, then tested, to assess whether the hypothesis could be supported or not. In addition, a summary of the qualitative data collected was presented. A thematic overview of the qualitative data was described. Chapter six will summarize the key findings in the data, discuss the implications and provide suggestions for further research.

Chapter Six

CONCLUSIONS AND SUGGESTIONS FOR FURTHER STUDY

6.1 Introduction

This chapter provides a summation of the conclusions derived from the data collected. As well, it the chapter will detail reflections on the methodology used and the significance of the findings. Finally, suggestions for further research will be presented.

6.2 Summary of the Findings

The main purpose of this study was to determine the relationship between the attitude and ability of teachers and the computer use of students. Specifically, the computer attitude of teachers and the computer ability of teachers along with demographic and environmental variables were examined. The results then were correlated with three areas of student use; overall computer use, frequency of specific types of computer use, and computer use in specific subject areas. After examining the data, the following conclusions can be drawn. The conclusions are grouped and analyzed from the perspective of the three areas of student use.

The mean score for the overall frequency of student computer use was 2.62 with a standard deviation of 1.23. This indicates an average overall frequency of between 30 minutes and two hours per school week. Teachers responded that nearly 13% of students spend less than 30 minutes per week. Substantially more than half (62%) of students in

this study spend between thirty minutes and two hours per week on a computer. This is a similar result to the Saskatchewan Education study. Although comparative data for all grades in the province are not available, upon examining the three grades for which comparative data is available (grade 5, 8, and 11), the results are similar.

This study did not find a significant correlation between the overall frequency of computer use of students and the attitude of teachers. Similarly, no correlation was found between the computer ability of teachers and the overall frequency of computer use by students. When considering demographic and environmental variables of teachers, here too, no significant correlation was found with any of the variables. The results from this study indicate that attitude, ability, demographic and environmental variables are not significantly related to the overall frequency of computer use by students.

When analyzing the frequency of specific types of computer use by students a number of findings arose. When the results of almost-always and often are combined, keyboarding is the predominant activity of students (69 %), followed closely by educational games (61 %). Word processing, Internet for research and non-educational games are the only other three activities that occur either often or almost-always more than one half the time at 52%, 51% and 50% respectively. Generally, typing, games, word processing and Internet research are the main activities of students. Higher level computer use (spreadsheet, databases, graphics) is not as prevalent.

A significant correlation was found between the attitude of teachers and a number of specific types of activities. A significant positive correlation was found between teachers' attitudes and keyboarding, Internet for research, word processing, e-mail,

spreadsheets and databases. Although not significant, a negative correlation nonetheless was found between the attitudes of teachers and the use of educational games.

Almost all activity types had a specific positive correlation with teachers' computer ability. Programming and multi-media production showed a positive correlation, however, the relationship was not deemed significant. Likewise, both the use of games (both educational and non-educational) showed a negative albeit non-significant correlation. A significant relationship was found in five cases between the demographic variables of teachers and the specific activity types of students. A positive correlation was found between females and the use of the Internet for research. Similarly, the use of e-mail also showed a positive correlation with female teachers. Another significant relationship was found between the use of spreadsheets and the two variables of age and experience. Older, more experienced teachers were more likely to use spreadsheets. Closely paralleling this is the use of databases. A positive correlation between experience and the use of databases was found.

An analysis of the environmental variables of teachers in relation to specific student computer activity type revealed that as the level of teacher computer use rose, so too did the use of keyboarding, Internet, word processing and e-mail. Having a computer at home made it less likely that teachers would use games (both educational and non-educational) with their students. Having the Internet at home also seemed to mean fewer games in classrooms. Teachers who have and use e-mail were, not surprisingly, more likely to use Internet, word processing and e-mail in their classrooms. No relationship was found

between teachers' awareness of Saskatchewan Education's Evergreen Curriculum and any of the specific activity types. Access to technical support generally meant fewer games.

The significance of inservice was evident. A significant positive relationship was found between the completion of inservice and what are generally felt to be higher level computer activities. Those students of teachers who had received inservice were more likely to do programming, web page design, databases and spreadsheets.

When examining the internet use of computers in seven different subject areas, data from this study showed a much higher use in all subject areas and all three grade levels than did the Saskatchewan Education study of Grade 5, 8 and 11 students. A comparison of the non-internet use of computers yields less stark results. Northern students in grades 5, 8, and 11 tend to use computers more often than the rest of the province in the subject areas of language arts and math, are about on par in social studies and science, but lag behind in arts education, health/wellness and phys ed. (in grades 5 and 8). Insufficient data were gathered to draw a conclusion with respect to computer use in grade 11.

This study found a significant relationship between teachers' computer attitudes and the Internet use of computers in six of seven subject areas. Math was the only subject area not to show a positive relationship. When examining the non-internet use of computers, arts education was the only subject area not to show a positive correlation.

The Internet use of computers in relationship to computer ability, closely mirrored the results of computer attitude. All subject areas except math demonstrated a positive correlation. This would lead one to consider that further research into the use of Internet in the teaching of math may be of some value. The non-internet use of computers in arts

education was related to the ability of teachers. A significant positive correlation was also found in the subjects of science and social studies.

A significant relationship was found between gender and the use of computers in different subject areas. In the Internet use of computers, a significant relationship was found between gender and the subjects of language arts, science, social studies and phys.ed. Males were more likely than females to use the Internet in those subject areas.

Increased teacher use was shown to be related to increased use of the Internet in five of seven different subject areas. Math and arts education were the exception. A computer at home seemed to translate into more use in social studies and health/wellness, and Internet use at home lead to more use of the Internet in Science class. Use of e-mail was shown to be related to increased internet use in language arts, science and social studies and familiarity with Evergreen Curriculum was related to an increased use of internet in health/wellness. The two variables of access to support and completion of inservice showed no relationships to the use of the Internet in subject areas.

Demographic and environmental variables had a much lesser impact on the non-internet use of computers than on the internet use. Only four significant relationships were found. Use of e-mail tended towards an increased use of computers in health/wellness. Familiarity with the Evergreen Curriculum showed a negative relationship to the use of computers in arts education, and the completion of inservice tended to increase the use of computers in math and science.

6.3 Reflections on Methodology

This study used primarily quantitative and to a lesser degree qualitative methods to gather data. The quantitative methods of data collection, the survey, worked as planned. The survey was developed, tested and administered data was collated, analysed and presented. Aside from minor delays in receiving completed surveys (two weeks beyond expected) sufficient data was collected to proceed with the study.

The methodology used to gather qualitative data was not successful. The intent was to have survey participants volunteer to participate in a face to face interview session. Originally, twelve participants agreed to the interview. When contacted to arrange an interview session, six participants reneged on their commitment. Of the six, five asked to have the questioned forwarded to them for response without an interview, and one participant asked to have the interview rescheduled to the fall. As a result, no formal interview sessions were conducted.

Upon reflection, this study was originally designed to be quantitative. The inclusion of qualitative methodology was suggested and incorporated. Some of the people in the original pilot group expressed concern about the feasibility of the interview session given the sparse population of the region and difficulty in travel.

Two possible reasons are offered to explain why the qualitative methodology was not as successful as expected. First, insufficient effort was made to compensate for the geography of the region and dispersal of the population to ensure that interview sessions could happen. Second, timing became an issue. Since all northern schools are on a modified school year, the school year ended at the beginning of June. There simply was

insufficient time for teachers to participate. Any future studies should take these factors into consideration.

6.4 Significance of Findings

This study is significant for three reasons. First, it is significant because it determined that no relationship was found between the attitude, ability, demographic or environmental variables of teachers and the overall frequency of student computer use. Second, this study is relevant because it determined that a significant relationship was found between the attitude, ability, demographic and environmental variables of teachers and specific types of student computer use. And third, this study also showed a relationship exists between attitude, ability, demographic and environmental variables of teachers and the frequency of computer use in specific subject areas.

These findings can be helpful to educational decision makers when determining allocation of computer resources and determination of computer time allocations. These findings are also significant to educational leaders interested in the level of computer integration into specific subject areas. Final, the results may be useful to teachers themselves in reflecting upon their use of computers with their students.

6.5 Suggestions for Further Research

The completion of this study highlights a number of areas for further research. First, research into how computer time is allocated in schools would be useful. This study has shown that attitude, ability, demographic and environmental variables were not

related to the overall amount of time students spend on computers. This would indicate that other factors such as scheduling and computer to student ratios may be significant.

Second, although this study has shown that a relationship exists between attitude and ability of teachers and the type of computer use of students, as well as increased use in specific subject areas, this study does not show how effectively students are using computers. Research on how effectively students are using computers in schools would be helpful information.

Third, a positive correlation was found between females and the use of the Internet for research. Similarly, the use of e-mail also showed a positive correlation with female teachers. Further investigation into the topic of gender differences and computer use patterns may help to explain this finding.

Finally, this study found a significant relationship between teachers' computer attitudes and the Internet use of computers in six of seven subject areas. Math was the only subject area not to show a positive relationship. The use of the Internet in relation to computer ability mirrored the results of computer attitude. All subject areas except math demonstrated a positive correlation. Additional research into the use of computers in math instruction would be useful.

REFERENCES

Atkins, Nancey Ellen., Vasu, Ellen Story., (2000) Measuring knowledge of technology usage and stages of concern about computing: A study of middle school teachers. Journal of Technology and Teacher Education (2000) 8 (4), 279-302

Austin, Sandra I., (1999) Baccalaureate Nursing Faculty Performance of Nursing Computer Literacy Skills and Curriculum Integration of These Skills Through Teaching Practice, *Journal of Nursing Education, 38 (6), 260-266*

Ayerson, David J.; And Others (1996) Creating a computer competency requirement for Mary Washington College Students 8p.; In: Association of small computer users in education (ASCUE) Summer Conference Proceedings (29th, North Myrtle Beach, SC, June 9-13, 1996)

Cameco Access Program for Engineering and Science Annual Report (1998)

Christensen, R., Knezek, G., (2000) Internal Consistency Reliabilities for 14 Computer Attitude Scales. *Journal of Technology and Teaching Education., 8(4), 327-336*

Delcourt, M. A., & Kinzie, M. B. (1993). Computer technologies in teacher education: The measurement of attitudes and self-efficacy. *Journal of Research and Development in Education, 27, 35-41*

Ellsworth, R., and Bowman, B.E. (1982) A "beliefs about computers" scale based on Ahl's questionnaire items. *The Computing Teacher, 32-34*

Francis, Leslie J. (1993). Measuring attitude toward computers among undergraduate college students: the affective domain. *Computers in Education, 20, 3, 251-255.*

Fetler, Mark., (1985) Sex differnces on the California statewide assessment of computer literacy. Sex Roles, (13) Nos 3 and 4

Gall, M.D., Borg, W.R., & Gall, J.P. (1996). Educational Research (6th ed.). White Plains, N.Y.: Longman Publishers, U.S.A.

Greschner, K.J. (1997) Northern Educators Computer Survey. *Unpublished, La Ronge, SK.*

Gressard, C P and Loyd, B H (1986) Validation studies of a new computer attitude scale. *Association for Educational Data Systems Journal 18 295-301*

Jones, M., Pearson, R., (1996). Developing an Instrument to Measure Computer Literacy, *Journal of Research on Computing in Education, v29, 17-28*

Kay, R. H. (1990). Predicting student teacher commitment to the use of computers. *Journal of Educational Computing Research, 6, 299-309.*

Kay, R. H. (1993a). A Practical Research Tool for Assessing Ability to Use Computers: The Computer Ability Survey. *Journal of Research on Computing in Education, 26 (1), 16-27*

Kay, R. H. (1993b). An exploration of theoretical and practical foundations for assessing attitudes toward computers: The computer attitude measure (CAM). *Computers in Human Behavior, 9, 371-386.*

Khine (2001), Attitudes towards computers among teacher education students in Brunei Darussalam. *International Journal of Instructional Media, 28, 2*

Kim, JinGyu (1994). A cross cultural validation study of the computer attitude scale. Paper presented at the Annual Meeting of the Mid-South Educational Research Association (Nashville, TN, Nov 9-11)

Kluever, R.C., Lam, T.C.M., Hoffman, E.R., Green, K.E., & Swearingen, D.L. (1994). The computer attitude scale: Assessing changes in teachers' attitudes toward computers. *Journal of Educational Computing Research, 11 (3) 251-261*

Koohang, A.A. (1987). A study of the attitudes of preservice teachers toward the use of the computers. *Educational Communication and Technology Journal, 35(3), 145-149.*

Koohang, A.A. (1989). A study of attitudes toward computer: anxiety, confidence, liking, and perception of usefulness. *Journal of Research on Computing in Education, 137-150.*

Larson, J., Smith, M., (1994), An Assessment of the Computer Literacy and Computer Attitudes of Incoming First-Year Students at the University of Wisconsin-Eau Claire, *Paper presented at the 1994 National Convention of the Association for Educational Communications and Technology (Nashville, TN) February 16-20.*

Lau, Sim Kim; Ang, Yang, (1998). Attitudes of University Students to Computing: An Australian Perspective. World Conference on Educational Telecommunications (Freiburg, Germany, Jun 20-25)

Lee, R.S. (1970). Social attitudes and the computer revolution. *Public Opinion Quarterly, 34, 53-59.*

Liao, Yuen-kuang (1999) Gender Differences on Attitudes Towards Computers: Ameta-Analysis. *Paper presented at the Society for Information Technology & Teacher Education International Conference, San Antonio, TX., February 28-March 4.*

Lockheed, Nielsen and Stone (1985), Determinants of microcomputer literacy in high school students. *Journal of Educational Computing Research, 1(1), 81-96.*

Loyd, B.H., & Gressard, C. (1984a). Reliability and factorial validity of computer attitude scales. *Educational and Psychological Measurement, 44, 501-505.*

Loyd, B., & Gressard, C. (1984b). The effects of sex, age, and computer experience on computer attitudes. *AEDS Journal, 18(2), 67-77.*

Loyd, B.H., Loyd, D.E., (1985) The reliability and validity of an instrument for the assessment of computer attitudes., *Educational and Psychological Measurement, 45, 73-87*

Mcfarlane, Hoffman and Green (1997), Teachers' attitudes toward technology: Psychometric evaluation of the technology attitude survey. *Paper presented at the annual meeting of the American Educational Research Association, Washington D.C., March 24-28*

Metu, R. (1994). A Study of the Computer Attitudes of Nigerian Teachers. *M.A. Thesis, California State Polytechnic.*

Mitra, A., (1998) Categories of Computer Use an Their Relationship with Attitudes Towards Computers, *Journal of Research on Computing in Education 30 no. 3 Spring 1998*

Molnar, A.R. (1978), The next great crisis in American education: Computer literacy. *AEDS Journal, 11(1), 11-20.*

Necessary, J.R., Parish, J (1996) The Relationship Between Computer Usage and Computer Related Attitudes and Beliefs *Education (Chula Vista, California) v116 p384-6 Spring 1996*

Nash, John, B., Moroz, Pauline (1997a), Computer Attitudes among Professional Educators: The Role of Gender and Experience, *Paper presented at the annual meeting of the southwest Education Research Association, Austin, TX. January 23-25*

Nash, John, B., Moroz, Pauline (1997b), An Examination of the Factor Structure of the Computer Attitude Scale, *Paper presented at the annual meeting of the American Educational Research Association, Chicago, IL, March 24-28.*

Northern Labour Market Committee NLMC (2002) *Regional Training Needs Assessment Report*

Pinto, J.N., Calvillo, M.J., (1985). Concurrent validity study of the computer attitude scale (CAS) *Paper presented at the annual meeting of the Midwestern Psychological Association, Chicago, IL, May 2*

Oils Sands Sub-Committee of the Northern Labour Market Committee, Minutes, October 2002

Omar, Mohammed H. (1992). Attitudes of college students towards computer: a comparative study in the United States and the Middle East. *Computers in Human Behavior, 8, 249-257.*

Pepper, K. (1999) A Comparison of the Attitudes towards Computer Use of Preservice and Inservice Teachers, Paper presented at the Annual Meeting of the Mid-South Educational Research Association, (Point Clear, AL.), November 17-19.

Pope-Davis, D.B., & Twing, J.S. (1991). Gender and computer experience as factors in the computer attitudes of middle school students. *Computers in Human Behavior, 7, 333-339*

Province of Saskatchewan Northern Education Task Force (1989) *Report to the Minister of Education Summary of Findings*

Province of Saskatchewan Education Act (1995) *Queens Printer, Regina, Canada*

Province of Saskatchewan Northern Municipalities Act (1983) *Queens Printer, Regina, Canada*

Reece, M. J., and Gable, R. K. (1982) The development and validation of a measure of general attitudes toward computers. *Educational and Psychological Measurement 42 913-916*

Saskatchewan Education (2001). 1999 Provincial Learning Assessment in Technological Literacy, *Regina, SK.*

Savenye, (1993). Measuring teacher attitudes towards interactive computer technologies. Paper presented at the annual conference of the Association for the Educational Communications and Technology, (New Orleans, LA.), January

Sheffler, F.L., Logan, J.P., (1996) Computer Technology in Schools: What Teachers Should Know and Be Able to Do. *Journal of Research on Computing in Education. 31 (3) 305-326*

Statistics Canada; Presentation to Industry Canada, November 1999. http://www.schoolnet.ca/accueil/e/research_papers/research/canadian_research/sites_(cda+int'l).ppt

U.S. Department of Education. (2001). *Internet Access in U.S. Public Schools and Classrooms: 1994-2000* (NCES Publication No. 2001-071). Jessup, MD:

Williams, F. Coulombe, J. & Lievrouw, L. (1983) Childrens attitudes towards small computers: A preliminary study. *Educational Communication and Technology Journal, 31, 3-7*

Woodrow, J E J (1991) A comparison of four computer attitude scales *Journal of Educational Computing Research 7 165-187*

Yildirim, Soner. (2000) Effects of an Educational Computing Course on Preservice and Inservice Teachers: A Discussion and Analysis of Attitude and Use. *Journal of Research on Computing in Education v32, no4, 479-95*

Zhang, Y. Espinoza, S. (1998) Relationships Among Computer Self-efficacy, Attitudes Towards Computers, and Desireability of Learning Computing Skills. *Journal of Research on Computing in Education 30 no. 4 Summer 1998*

Zoller, U., Ben-Chaim, D., (1996) Computer Inclination of Students and Their Teachers in the context of Computer Literacy Education *The Journal of Computers in Mathematics and Science v15, no4 p401-21 1996*

APPENDIX A

Questionnaire

Teachers Computer Survey
(TCS)

INSTRUCTIONS
(Please Read)

Thank you for agreeing to participate in the Teachers Computer Survey. We are asking that the survey be completed by all teachers in your school. The survey is designed to be completed in very little time. The purpose of the survey is to determine three things:

1) the attitude of teachers towards the use of computers;
2) the competency that teachers have to use computers in teaching and learning,
3) the frequency and type of activity that students are using computers for.

The survey is being conducted by Kelvin (Toby) Greschner as part of a Graduate Studies program at the University of Saskatchewan, in co-operation with Saskatchewan Education and your school division. All responses will be kept strictly anonymous. A copy of the results of the survey will be sent to your school early in the new year. Please answer as accurately as possible. Your participation is greatly appreciated.

Please complete the survey and return it to your principal by **March 23, 2002.**

Teachers Computer Survey

Part A: Demographic Data

Page 1

1. What is your gender?
   ☐ Female ☐ Male

2. What age category do you fall into?
   ☐ 21 to 30 ☐ 31 to 40 ☐ 41 to 50 ☐ 51 to 60 ☐ over 60

2b. How long have you been teaching?
   ☐ < 1 year ☐ 1 to 5 yrs ☐ 6 to 10 yrs ☐ 11 to 20 yrs ☐ more than 20 yrs

3. How often do you use a computer per week
   ☐ zero
   ☐ less than 30 minutes
   ☐ more than 30 minutes but less than 1 hour
   ☐ more than 1 hour but less than 2 hours
   ☐ more than 2 hours but less than 4 hours
   ☐ more than 4 hours

4. Do you have access to a personal computer at home? ☐ Yes ☐ No

5. Do you have access to the internet at home? ☐ Yes ☐ No

6. Do you have and use an e-mail account? ☐ Yes ☐ No

7. Are you familiar with Saskatchewan Educations Evergreen Curriculum? ☐ Yes ☐ No

8. Does your school have a technical support person? ☐ Yes ☐ No

9. Have you received inservice on using computers in instruction? ☐ Yes ☐ No

10. What grade do you teach? (For teachers of split grade and multigrade classrooms check all that apply. For teachers who teach classes at more than one grade level, check all that apply)

☐K ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 ☐8 ☐9 ☐10 ☐11 ☐12

End of page 1. Go on to page 2

Part B: Attitude About Computers

Instructions: ***Please respond to the statements about computing listed below by checking the appropriate box.***

		Strogly Disagree	Disagree	Neutral	Agree	Strongly Agree
11.	The challenge of solving problems with computers appeals to me.	☐	☐	☐	☐	☐
12.	I am not the type to do well with computers.	☐	☐	☐	☐	☐
13.	I look forward to using computers with my students.	☐	☐	☐	☐	☐
14.	Generally, I feel O.K. about trying something new on a computer	☐	☐	☐	☐	☐
15.	I enjoy working with computers.	☐	☐	☐	☐	☐
16.	Anything that a computer can be used for I can do just as well some other way.	☐	☐	☐	☐	☐
17.	I want to teach in a school that doesn't put a big emphisis on computers.	☐	☐	☐	☐	☐
18.	I feel insecure about my computer ability.	☐	☐	☐	☐	☐
19.	I am capable of learning computer skills on my own.	☐	☐	☐	☐	☐
20.	I do not feel threatened when others talk about computers.	☐	☐	☐	☐	☐
21.	I have a lot of self confidence when it comes to working with computers in the classroom	☐	☐	☐	☐	☐
22.	Figuring out computer problems does not appeal to me.	☐	☐	☐	☐	☐
23.	I am capable of integrating the use of computers into instruction.	☐	☐	☐	☐	☐
24.	I would like to learn more about computers.	☐	☐	☐	☐	☐
25.	Computers can be a useful instructional aide in many subject areas.	☐	☐	☐	☐	☐
26	The thought of teaching kids using computers appeals to me.	☐	☐	☐	☐	☐
27.	Computers make me feel uneasy and comfused.	☐	☐	☐	☐	☐
28.	I am helpless when selecting a computer or software on my own.	☐	☐	☐	☐	☐
29.	Computers are gaining to much control over my life.	☐	☐	☐	☐	☐
30.	Using computers as a teaching tool puts to much additional work on teachers.	☐	☐	☐	☐	☐
31.	I get nervous when I think about how I will use computers in my classroom.	☐	☐	☐	☐	☐
32.	I do not enjoy talking with other educators about computers.	☐	☐	☐	☐	☐
33.	Once I start to work with the computer I find it hard to stop.	☐	☐	☐	☐	☐
34.	Overall, computers have more disadvantages than advantages.	☐	☐	☐	☐	☐

End of page 2. Go on to page 3

Part C: Ability Self Assessment

Instructions: ***Please indicate your ability for each of the skills listed below by checking the appropriate box. Definitions are listed for each of the terms.***

None:	***Have never attempted***
Minimal:	***Briefly attempted with little success or understanding***
Average:	***Able to perform basic operation but not with complete understanding***
Advanced:	***Able to perform most operations with good understanding***
Exceptional:	***Extremely competent with excellent understanding***

	None	Minimal	Average	Advanced	Exceptional
35. Ability to use software to facilitate instruction	☐	☐	☐	☐	☐
36. Ability to evaluate software for instructional purposes	☐	☐	☐	☐	☐
37. Ability to use computers to help students develop higher-order thinking skills.	☐	☐	☐	☐	☐
38. Ability to develop lesson plans using computers in instructions.	☐	☐	☐	☐	☐
39. Ability to use a word processor.	☐	☐	☐	☐	☐
40. Ability to use operating system software.	☐	☐	☐	☐	☐
41. Ability to assess students needs for computer-based instruction applications.	☐	☐	☐	☐	☐
42. Ability to develop a plan to integrate computers into the learning environment.	☐	☐	☐	☐	☐
43. Ability to differentiate among instructional computer applications.	☐	☐	☐	☐	☐
44. Ability to demonstrate use of computer technology for basic skills instruction.	☐	☐	☐	☐	☐
45. Ability to plan effective pre and post computer interaction activities for students.	☐	☐	☐	☐	☐
46. Ability to use the computer for instruction.	☐	☐	☐	☐	☐
47. Ability to use computer courseware to individualize instruction.	☐	☐	☐	☐	☐
48. Ability to integrate computer awareness and literacy into the curriculum.	☐	☐	☐	☐	☐
49. Ability to evaluate/modify applications of computer instruction in curricula	☐	☐	☐	☐	☐
50. Ability to integrate, where appropriate, computer applications in a variety of subject content areas, in a variety of teaching and learning strategies.	☐	☐	☐	☐	☐
51. Ability to demonstrate how to use computerized simulations as a teaching tool.	☐	☐	☐	☐	☐
52. Ability to evaluate the effectiveness of computer based instruction on achievement.	☐	☐	☐	☐	☐
53. Ability to Identify, evaluate, select and develop instructional, materials for specific learning situations using computers.	☐	☐	☐	☐	☐
54. Ability to use a database program to maintain student records and resource files.	☐	☐	☐	☐	☐
55. Ability to use presentation software to create lessons.	☐	☐	☐	☐	☐
56. Ability to demonstrate ways to integrate the use of computer related materials with non-computer materials, including manipulatives.	☐	☐	☐	☐	☐
57. Ability to utilize network resources such as the internet to conduct research and communicate ideas.	☐	☐	☐	☐	☐
58. Ability to use e-mail as a personal and professional tool.	☐	☐	☐	☐	☐

End of page 3. Go on to page 4

Part D: Student Usage

Instructions: ***Please respond to the following questions about your student usage of computers listed below by checking the appropriate box.***

59. On average, a typical student in my class would spend approximately what amount of time on a computer?

- ☐ zero
- ☐ less than 30 minutes per six day school week
- ☐ more than 30 minutes but less than 1 hour per six day school week
- ☐ more than 1 hour but less than 2 hours per six day school week
- ☐ more than 2 hours but less than 4 hours per six day school week
- ☐ more than 4 hours

60. Indicate how often your students utilize the types of applications listed below during the time they use a computer.

Keyboarding	☐ never	☐ seldom	☐ often	☐ almost always
Using Internet for research	☐ never	☐ seldom	☐ often	☐ almost always
Word processing	☐ never	☐ seldom	☐ often	☐ almost always
E-mail	☐ never	☐ seldom	☐ often	☐ almost always
Graphics and Animation	☐ never	☐ seldom	☐ often	☐ almost always
Spreadsheets	☐ never	☐ seldom	☐ often	☐ almost always
Games (non educational)	☐ never	☐ seldom	☐ often	☐ almost always
Games (educational)	☐ never	☐ seldom	☐ often	☐ almost always
Programming	☐ never	☐ seldom	☐ often	☐ almost always
Web page design	☐ never	☐ seldom	☐ often	☐ almost always
Multimedia (audio/video)	☐ never	☐ seldom	☐ often	☐ almost always
Databases	☐ never	☐ seldom	☐ often	☐ almost always
Subject specific software (eg: physics software, etc)	☐ never	☐ seldom	☐ often	☐ almost always

61. Indicate if your students have used the internet in the subject areas listed.

Language Arts	☐ yes	☐ no	☐ don't teach this subject area
Mathematics	☐ yes	☐ no	☐ don't teach this subject area
Science	☐ yes	☐ no	☐ don't teach this subject area
Social Studies	☐ yes	☐ no	☐ don't teach this subject area
Health/Wellness	☐ yes	☐ no	☐ don't teach this subjet area
Arts Ed	☐ yes	☐ no	☐ don't teach this subject area
Phys.Ed	☐ yes	☐ no	☐ don't teach this subject area

62. Indicate if your students use a computer and software (non-internet) in the subject areas listed.

Language Arts	☐ yes	☐ no	☐ don't teach this subject area
Mathematics	☐ yes	☐ no	☐ don't teach this subject area
Science	☐ yes	☐ no	☐ don't teach this subject area
Social Studies	☐ yes	☐ no	☐ don't teach this subject area
Health/Wellncss	☐ yes	☐ no	☐ don't teach this subject area
Arts Ed	☐ yes	☐ no	☐ don't teach this subject area
Phys.Ed	☐ yes	☐ no	☐ don't teach this subject area

Part E: Interview Session (Optional) Page 5

Instructions: ***If you would like to volunteer to participate in a follow up interview session, please complete the information below. Detach this page and submit it seperatly. The interview will be conducted by phone or in person depending on your proximity. It is anticipated to take 10 to 15 minutes.***

Name: _____

School: _____

Phone Number: _____

E-mail: _____

Signature _____

End of page 5. You are finished. Return this survey to your principal. Thank you for your participation.

APPENDIX B

Tables

Table 5.6
Correlation of Teacher Demographic Variables vs. The Frequency of Specific Types of Computer Activity by Students

		Keyboarding	Internet	Word Processing	E-mail	Graphics and Animation	Spreadsheets	Games (Non Educational)
Gender								
	Pearson Correlation	-.069	-.195*	-.137	-.184*	.065	.035	-.093
	Sig. (2-tailed)	.397	.016	.092	.024	.428	.665	.253
	N	153	154	153	150	152	152	153
Age								
	Pearson Correlation	-.143	-.121	-.107	.038	.118	.239*	-.056
	Sig. (2-tailed)	.081	.140	.191	.651	.151	.003	.493
	N	150	151	150	147	149	149	150
Experience								
	Pearson Correlation	-.140	-.071	-.062	.087	.108	.225*	-.083
	Sig. (2-tailed)	.088	.390	.451	.299	.192	.006	.314
	N	149	150	150	146	148	148	149

		Games (Educational)	Programming	Web Page Design	Multimedia	Database	Subject Specific Software
Gender							
	Pearson Correlation	.055	.085	-.021	-.004	-.138	-.100
	Sig. (2-tailed)	.501	.302	.800	.961	.093	.224
	N	152	149	151	151	149	151
Age							
	Pearson Correlation	-.076	.101	.094	.128	.152	.150
	Sig. (2-tailed)	.359	.223	.255	.120	.068	.070
	N	149	146	148	148	146	147
Experience							
	Pearson Correlation	-.139	.068	.140	.131	.184*	.135
	Sig. (2-tailed)	.091	.416	.089	.111	.026	.102
	N	149	146	148	148	146	147

** Correlation is significant at the 0.01 level (2 tailed) *. Correlation is significant at the 0.05 level (2 tailed)

Table 5.7
Correlation of Teacher Environmental Variables vs. The Frequency of Specific Types of Computer Activity by Students

		Keyboarding	Internet	Word Processing	E-mail	Graphics and Animation	Spreadsheets	Games (Non Educational)
Teacher use								
	Pearson Correlation	.192(*)	.237(**)	.379(**)	.262(**)	0.129	0.133	.040
	Sig. (2-tailed)	0.019	0.003	0	0.001	0.116	0.106	.631
	N	150	151	150	147	149	149	150
Computer at Home								
	Pearson Correlation	0.071	0.08	0.074	0.116	-0.055	-0.04	-.163*
	Sig. (2-tailed)	0.384	0.324	0.361	0.157	0.5	0.621	.044
	N	153	154	153	150	152	152	153
Internet at Home								
	Pearson Correlation	0	0.054	0.026	0.143	-0.028	0.016	-.152
	Sig. (2-tailed)	0.996	0.51	0.747	0.081	0.736	0.84	.061
	N	153	154	153	150	152	152	153
Use E-mail								
	Pearson Correlation	0.158	.223(**)	.230(**)	.275(**)	-0.014	0.007	000
	Sig. (2-tailed)	0.052	0.005	0.004	0.001	0.861	0.928	.996
	N	153	154	153	150	152	152	153
Aware of Evergreen								
	Pearson Correlation	0.025	0.039	0.048	0.02	-0.047	-0.062	-.053
	Sig. (2-tailed)	0.761	0.628	0.558	0.806	0.566	0.449	.515
	N	153	154	153	150	152	152	153
Access to Technical Support								
	Pearson Correlation	-0.04	-0.08	0.046	-0.085	0.063	-0.054	-.098
	Sig. (2-tailed)	0.625	0.323	0.571	0.299	0.442	0.508	.230
	N	153	154	153	150	152	152	153
Completed Inservice								
	Pearson Correlation	0.087	-0.048	0.109	0.062	.274(**)	0.071	-.026
	Sig. (2-tailed)	0.285	0.554	0.179	0.449	0.001	0.382	.751
	N	153	154	153	150	152	152	153

** Correlation is significant at the 0.01 level (2 tailed) * Correlation is significant at the 0.05 level (2 tailed)

Table 5.7 Continued

Correlation of Teacher Environmental Variables vs. The Frequency of Specific Types of Computer Activity by Students

		Games (Educational)	Programming	Web Page Design	Multimedia	Databases	Subject Specific Software
Teacher use							
	Pearson Correlation	-.004	-0.108	0.113	0.151	0.13	0.131
	Sig. (2-tailed)	.960	0.196	0.172	0.066	0.115	0.113
	N	149	146	148	148	147	148
Computer at Home							
	Pearson Correlation	-.268*	-0.09	-0.003	-0.072	-0.066	-0.022
	Sig. (2-tailed)	.001	0.277	0.972	0.378	0.425	0.79
	N	152	149	151	151	149	151
Internet at Home							
	Pearson Correlation	-.258*	0.04	0.08	0.012	-0.014	0.05
	Sig. (2-tailed)	.001	0.625	0.329	0.883	0.865	0.546
	N	152	149	151	151	149	151
Use E-mail							
	Pearson Correlation	-.051	-0.043	0.105	0.088	0.081	0.079
	Sig. (2-tailed)	.529	0.601	0.201	0.285	0.328	0.333
	N	152	149	151	151	149	151
Aware of Evergreen							
	Pearson Correlation	-.021	0.034	0.04	0.017	-0.029	0.005
	Sig. (2-tailed)	.797	0.679	0.623	0.838	0.73	0.956
	N	152	149	151	151	149	151
Access to Technical Support							
	Pearson Correlation	-.171*	0.104	0.1	0.08	0.083	0.125
	Sig. (2-tailed)	.035	0.206	0.221	0.327	0.315	0.126
	N	152	149	151	151	149	151
Completed Inservice							
	Pearson Correlation	-.036	.227(**)	.255(**)	.171(*)	.218(**)	0.156
	Sig. (2-tailed)	.660	0.005	0.002	0.036	0.008	0.056
	N	152	149	151	151	149	151

** Correlation is significant at the 0.01 level (2 tailed) * Correlation is significant at the 0.05 level (2 tailed)

Table 5.14
Correlation of Demographic and Environmental Variables of Teachers vs. Internet Use of Computers in Subject Area

		L.A.	Math	Science	Soc. St.	Hea/Well	Arts Ed	Phys Ed
Gender								
	Pearson Correlation	-.189(*)	-0.047	-.333(**)	-.341(**)	-0.12	0.064	-.222(*)
	Sig. (2-tailed)	0.034	0.609	0	0	0.231	0.523	0.045
	N	127	121	117	116	102	103	82
Age								
	Pearson Correlation	-0.085	0.084	-0.03	-0.118	-0.095	-0.166	0.033
	Sig. (2-tailed)	0.347	0.366	0.75	0.215	0.349	0.098	0.769
	N	123	119	115	113	100	100	80
Experience								
	Pearson Correlation	-0.087	0.035	0.059	-0.059	0.017	-0.064	0.069
	Sig. (2-tailed)	0.335	0.707	0.528	0.535	0.862	0.524	0.541
	N	124	120	116	114	101	102	81
Teacher use								
	Pearson Correlation	.285(**)	0.172	.225(*)	.279(**)	.237(*)	0.181	.234(*)
	Sig. (2-tailed)	0.001	0.063	0.016	0.003	0.018	0.071	0.038
	N	124	118	114	113	99	100	79
Computer at Home								
	Pearson Correlation	0.026	-0.116	0.143	.218(*)	.226(*)	-0.114	0.14
	Sig. (2-tailed)	0.775	0.206	0.125	0.019	0.023	0.25	0.21
	N	127	121	117	116	102	103	82
Internet at Home								
	Pearson Correlation	0.087	0.059	.189(*)	0.175	0.115	0.024	0.188
	Sig. (2-tailed)	0.33	0.521	0.041	0.061	0.251	0.813	0.09
	N	127	121	117	116	102	103	82
Use E-mail								
	Pearson Correlation	.273(**)	0.085	.217(*)	.340(**)	0.175	-0.014	0.121
	Sig. (2-tailed)	0.002	0.355	0.019	0	0.078	0.891	0.281
	N	127	121	117	116	102	103	82

Table 5.14 (Continued)
Correlation of Demographic and Environmental Variables of Teachers vs. Internet Use of Computers in Subject Area

		L.A.	Math	Science	Soc. St.	Hea/Well	Arts Ed	Phys Ed
Familiar with Evergreen Curriculum								
	Pearson Correlation	-0.039	-0.076	0.122	0.055	.195(*)	-0.026	-0.039
	Sig. (2-tailed)	0.662	0.405	0.191	0.556	0.049	0.795	0.73
	N	127	121	117	116	102	103	82
Access to Support								
	Pearson Correlation	-0.072	0.018	0.03	0.02	-0.058	-0.012	-0.038
	Sig. (2-tailed)	0.421	0.842	0.748	0.831	0.566	0.901	0.732
	N	127	121	117	116	102	103	82
Completion of Inservice								
	Pearson Correlation	-0.054	0.117	-0.008	-0.083	-0.164	0.024	0.111
	Sig. (2-tailed)	0.548	0.203	0.932	0.374	0.1	0.813	0.321
	N	127	121	117	116	102	103	82

** Correlation is significant at the 0.01 level (2-tailed).

- Correlation is significant at the 0.05 level (2-tailed).

Table 5.15

Correlation of Demographic and Environmental Variables of Teachers vs. Non-Internet Use of Computers in Subject Area

		L.A.	Math	Science	Soc. St.	Hea/Well	Arts Ed	Phys Ed
Gender								
	Pearson Correlation	0.138	0.105	-0.131	-0.016	0.01	0.065	0.085
	Sig. (2-tailed)	0.129	0.252	0.162	0.864	0.924	0.515	0.443
	N	122	121	116	111	101	104	83
Age								
	Pearson Correlation	-0.006	0.128	0.015	-0.011	0.032	0.003	-0.034
	Sig. (2-tailed)	0.95	0.166	0.875	0.908	0.753	0.973	0.764
	N	118	119	114	108	99	101	81
Experience								
	Pearson Correlation	-0.03	0.107	0.142	0.067	0.109	0.023	-0.008
	Sig. (2-tailed)	0.741	0.245	0.129	0.486	0.278	0.816	0.941
	N	120	120	115	110	100	103	82
Teacher use								
	Pearson Correlation	-0.017	-0.067	0.152	0.048	0.099	0.12	0.007
	Sig. (2-tailed)	0.858	0.469	0.107	0.623	0.331	0.23	0.952
	N	119	118	113	108	98	101	80
Computer at Home								
	Pearson Correlation	0.06	0.008	0.162	0.168	0.126	-0.038	0.06
	Sig. (2-tailed)	0.511	0.928	0.083	0.079	0.211	0.701	0.589
	N	122	121	116	111	101	104	83
Internet at Home								
	Pearson Correlation	0.002	0.121	0.018	-0.016	0.003	0.078	0.079
	Sig. (2-tailed)	0.982	0.186	0.848	0.864	0.977	0.433	0.479
	N	122	121	116	111	101	104	83

Table 5.15 (Continued)
Correlation of Demographic and Environmental Variables of Teachers vs. Non-Internet Use of Computers in Subject Area

		L.A.	Math	Science	Soc. St.	Hea/Well	Arts Ed	Phys Ed
Use E-mail								
	Pearson Correlation	0.127	0.037	0.16	0.126	.212(*)	0.035	0.045
	Sig. (2-tailed)	0.165	0.69	0.086	0.188	0.034	0.727	0.684
	N	122	121	116	111	101	104	83
Familiar with Evergreen Curriculum								
	Pearson Correlation	-0.134	-0.151	0.072	0.024	0.03	-.197(*)	0.041
	Sig. (2-tailed)	0.141	0.099	0.445	0.805	0.762	0.045	0.714
	N	122	121	116	111	101	104	83
Access to Support								
	Pearson Correlation	-0.065	0.088	0.045	0.017	-0.048	0.021	0.077
	Sig. (2-tailed)	0.48	0.338	0.629	0.863	0.632	0.83	0.491
	N	122	121	116	111	101	104	83
Completion of Inservice								
	Pearson Correlation	0.109	.198(*)	.196(*)	0.093	0.053	0.126	0.092
	Sig. (2-tailed)	0.231	0.03	0.035	0.334	0.6	0.204	0.408
	N	122	121	116	111	101	104	83

** Correlation is significant at the 0.01 level (2-tailed).

- Correlation is significant at the 0.05 level (2-tailed)

APPENDIX C

Correspondences

November 27, 2001

Kelvin J (Toby) Greschner
Box 5000
La Ronge, SK. S0J 1L0

TO: Directors, Northern Region – Provincial and First Nation Schools

RE: Teachers Computer Survey

This letter is to request permission to have the teachers in your schools participate in the ***Teachers Computer Survey.*** The survey is being conducted by myself as part of a Graduate Studies program at the University of Saskatchewan. I have attached a copy of the survey, as well as an accompanying cover letter for your perusal and approval. I would like to send to this to principals as soon as possible.

The purpose of the survey is to determine if a relationship exists between the computer attitude and competency of teachers and the frequency and type of computer use students are demonstrating in classrooms. All responses will be kept strictly anonymous and no reference to any particular school or teacher will be made. The survey is to be completed by all teachers in your schools. The survey is designed to be completed in less than 15 minutes. Interview sessions (10 to 15 minutes) with ten volunteer teachers from across the region will follow.

A complete analysis of the data will be forwarded to you upon completion of the study. I anticipate that the data derived from this study will be of benefit and interest to your schools in designing your staff development and educational technology plans.

Thank you in advance for considering this request. I look forward to your response. If you have any questions please contact myself or my faculty advisor, Professor Leonard F. Proctor, Ph.D., at the locations listed below.

Kelvin J (Toby) Greschner
Box 5000, La Ronge, SK., S0J 1L0
(306) 425-4380

Leonard F. Proctor, Ph.D., (Advisor)
College of Education, Room 3118
University of Saskatchewan
(306) 966-7638

Sincerely,

Kelvin J (Toby) Greschner
March 8, 2002

Kelvin J (Toby) Greschner

Box 5000
La Ronge, SK. S0J 1L0

TO: All Principals, Northern Region

RE: Teachers Computer Survey

Dear Principal,

This letter is to ask you and your staff to participate in the Teachers Computer Survey. The survey is being conducted by myself as part of a Graduate Studies program at the University of Saskatchewan, and is being done in co-operation with Saskatchewan Education and your school division.

The purpose of the survey is to determine if a relationship exists between the computer attitude and ability of teachers and the frequency and type of computer use students are demonstrating in classrooms. All responses will be kept strictly anonymous and no reference to any particular school or teacher will be made. The survey is to be completed by all teachers in your school. It is designed to be completed in less than 15 minutes. For your convenience, I have included a sufficient number of surveys for your staff, as well as a self addressed envelope for you to send the completed forms back in. I ask that the completed forms be mailed back by **Friday, March 22, 2002.** A detailed summary of the results will be sent to your school in the new year.

Thank you in advance for taking the time to participate in this survey. If you have any questions please contact myself or my faculty advisor, Professor Leonard F. Proctor, Ph.D., at the locations listed below.

Kelvin J (Toby) Greschner
Box 5000, La Ronge, SK., S0J 3G0
(306) 425-4380

Leonard F. Proctor, Ph.D., (Advisor)
College of Education, Room 3118
University of Saskatchewan
(306) 966-7638

Sincerely,

Kelvin J (Toby) Greschner

January 31, 2002

Kelvin J (Toby) Greschner
Box 5000
La Ronge, SK. S0J 1L0

TO: Deputy Directors, Superintendents, Program Supervisors,
Northern Region

RE: Teachers Computer Survey

Please find attached a copy of the **Teachers Computer Survey** that has been mailed to each of the schools in your region. The purpose of the survey is to determine three things: 1) the attitude that teachers have towards computers; 2) the ability that teachers have to use computers in teaching and learning; and 3) the frequency and type of activity that students are using computers for. All responses will be kept strictly anonymous and no reference to any particular school or teacher will be made. The survey is to be completed by all teachers in your schools. The survey is designed to be completed in less than 15 minutes.

If you have any questions please contact myself or my faculty advisor, Professor Leonard F. Proctor, Ph.D., at the locations listed below.

Kelvin J (Toby) Greschner
Box 5000, La Ronge, SK., S0J 3G0
(306) 425-4380

Leonard F. Proctor, Ph.D., (Advisor)
College of Education, Room 3118
University of Saskatchewan
(306) 966-7638

Sincerely,

Kelvin J (Toby) Greschner

November 27, 2001

Kelvin J (Toby) Greschner
Box 5000
La Ronge, SK.
S0J 1L0

Advisory Committee on Ethics in Behavioral Science Research,
Office of Research Services
Room 210, Kirk Hall
University of Saskatchewan

RE: Application for Approval of Research Protocol

Dear Chairperson,

Please find attached an *Application for Approval of Research Protocol*, submitted on behalf of myself under the advice and direction of my advisor, Dr. Leonard F. Proctor, Ph.D., College of Education. If clarification or additional information is required, please contact myself or Dr. Proctor at the locations listed below. Thank-you in advance for considering this request. We look forward to your response.

Kelvin J (Toby) Greschner
Box 5000, La Ronge, SK., S0J 1L0
(306) 425-4380
toby.greschner@sasked.gov.sk.ca

Leonard F. Proctor, Ph.D., (Advisor)
College of Education, Room 3118
University of Saskatchewan
(306) 966-7638
Proctor@skyway.usask.ca

Sincerely,

Kelvin J (Toby) Greschner
Attachments:
Application (3 pages)
Letter of Consent (3 pages)

Application for Research Protocol

1) **Name of Researcher and Supervisor**

a) Leonard F. Proctor, Ph.D. (Advisor)
Department of Curriculum Studies
College of Education, Rm. 3118
University of Saskatchewan

Kelvin J (Toby) Greschner (Master of Education Candidate)
Box 5000,
La Ronge, SK.
S0J 1L0

b) Anticipated start date of research study: December 2001
Expected completion date of study: February 2001

2) **Title of the Study**

The Relationship Between the Computer Attitude and Competency of teachers and the Frequency and Type of Computer Use by Students.

3) **Abstract**

This purpose of this study is to examine the computer attitude and competency of teachers and determine how it relates to the frequency and type of computer use students are demonstrating in classrooms. This study will utilize a 62-item survey, comprised of two separate assessment instruments and demographic questions. It will be distributed to all the k-12 teachers (n=685) in Provincial and First Nation schools in the Northern Educational Region of Saskatchewan. This survey will utilize a modified version of Loyd and Gressards (1984a) Computer Attitude Scale (CAS) which has been proven in numerous studies to be a highly reliable instrument for assessing attitude in the three sub categories of anxiety, confidence and liking. It has been modified to include "educational specific" questions. A second instrument will attempt to measure a teacher's "educational" computer competency. This instrument has been derived from a comprehensive list of "educational specific" competencies determined in a study by Scheffler and Logan (1999). Demographic variables such as age, gender, years of experience, access to computers, the Internet and e-mail will be queried. Environmental factors such as technical support and inservice support are also included. Further, participants will be asked to respond to questions about what type of activities their students are doing on computers, how often they are doing them and in which subject areas. These "student usage" variables are model on those in *the 1999 Provincial Learning Assessment in Technological Literacy* (Saskatchewan Education, 2001).

In addition to the questionnaire, participants will be asked to participate in a follow up interview session. Ten volunteers will be selected and will be asked to respond to five interview questions.

4) **Funding**
Saskatchewan Education (Northern Region) has agreed to pay for the cost of photocopying and mailing the survey. No additional funding has been sought.

5) **Participants**
Questionnaires will be sent to each teacher in the Northern Educational Region of the province of Saskatchewan who are currently teaching in either provincial or First Nation schools (n=685). Questionnaires, and a covering letter that serves as the consent form (attached), will be sent, via standard mail, to each teacher in mid December with a request to return the completed questionnaire by January 15, 2002. On the questionnaires, participants will be asked to volunteer to take part in a follow up interview session. From the pool of volunteers, 10 will be chosen to participate in the interview sessions. Selection of the interview participants will attempt to accurately reflect the geographic and demographic makeup of the target population. Interviews will be conducted between January 16 and March 1.

6) **Consent**
The completion of the survey will indicate consent to participate. Details of this will be clearly indicated in the *covering letter of consent* that goes to all participants (attached). However, for those who indicate interest in the follow up interview, and volunteer to participate, consent will constitute the signing of an additional *transcript release form* (attached). The letter of consent will detail their right to confidentiality and their right to withdraw from the study at anytime. Participation is strictly voluntary and any teacher who does not want to participate simply need not complete the questionnaire, and not participate in the follow up interview session. Since no names will be asked for on the survey, anonymity will be assured. Pseudonyms will be used when referring to data derive from the interview sessions. Verbal approval has been sought and received from each of the educational authorities involved. Written approval, in the form of a letter to Directors of Education, will be sought upon approval of this project (attached).

7) **Methods and Procedures**
This study will utilize two instruments of data collection. A survey questionnaire (attached) will be distributed to participants during December 2001, via standard mail, with a return request of January 15, 2002. On the questionnaire, participants will be asked to volunteer to participate in a follow up interview. Participants for the follow up interview (10) will be selected in an attempt to accurately reflect the demographic profile of the population. The interview session will consist of the researcher and the volunteer only. Questions will be provided to the volunteer in advance of the interview session (attached).

8) **Storage of Data**
Data will be securely stored at the University of Saskatchewan for the required five years upon completion of the study, after which time it will be destroyed. In this case Dr. Len Proctor, Professor of Education Curriculum will be responsible for the secure storage of the data.

9) **Dissemination of Results**
The results of this study will be shared with the Faculty of Education at the University of Saskatchewan, the Saskatchewan Department of Education and several northern school divisions and First Nation educational authorities. The results will also be used to complete requirements for a Master of Education degree, and may be used in the writing of journal articles and conference presentations. A copy of the results will be sent to each school that had teachers participating in the study. A written notice will be sent to all teachers advising them that a copy of the results of the research is available at their school for their perusal.

10) **Risk of Deception**
Participation in this study is completely voluntary and anonymity of participants in assured. Participants can withdraw without fear of penalty or any other reprisal. At no time will responses of participants be analyzed individually. Pseudonyms will be used when referring to data derive from the interview sessions Only aggregate data will be reported to further protect the confidentiality of participants.

11) **Confidentiality**
The participants will be reassured that all responses are anonymous. The names of participants will not appear anywhere in the results. The data will be stored at the University of Saskatchewan for the required period of five years (after which it will be destroyed) and will not contain any reference to the individuals nor the specific schools involved in the study. Confidentiality will further be assured by using identification numbers and pseudonyms for the participants in the interview sessions. Participants will be advised that discussions in the interviews will remain confidential.

12) **Data/Transcript Release**
Data/transcript release forms will be utilized for those participating in the interview sessions (attached). Each form will be signed after the participant has had the opportunity to read and revise his/her transcript and acknowledges its accurate portrayal of what has been said. The data/transcript release form used in this study will be the same as that given as a sample by the University of Saskatchewan Advisory Committee on Ethics in Behavioral Sciences Research, 2000.

13) **Debriefing and Feedback**
All those who participate in the survey questionnaire will be made aware of public access to the finished project, by means of a letter sent to each of the participants. A copy of the results will be sent to each school that had teachers participating in the study. A written

notice will be sent to all teachers advising them that a copy of the result of the research, for their perusal, .is available at their school and at the University of Saskatchewan's Education Library,

14) Signatures

_____
Department Head

_____
Advisor

_____
Applicant

15) Contact Information

Leonard F. Proctor, Ph.D. (Advisor)
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Kelvin J (Toby) Greschner (Master of Education Candidate)
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March 8, 2002

Kelvin J (Toby) Greschner
Box 5000
La Ronge, SK.
S0J 1L0

TO: Teachers, Northern Region – Provincial and First Nation Schools

RE: Teachers Computer Survey - Consent Form

This letter is to ask you to participate in the ***Teachers Computer Survey.*** This survey is being conducted by myself (Toby Greschner) as part of a Graduate Studies program at the University of Saskatchewan, in partnership with your school division and the northern education office.

The purpose of this study is to examine the computer attitude and competency of teachers and determine how it relates to the frequency and type of computer use students are demonstrating in classrooms. The objective of the study is to provide teachers and school administrators with information that may enhance the integration of computers into the teaching and learning process. The potential benefit to teachers and schools is that a better understanding of some of the factors involved in integrated computers into the educational process will be developed. Possibly, this will have a positive effect on the professional development of teachers. I must stress however, that these benefits are not guaranteed.

This study will utilize a sixty-two item survey, comprised of two separate assessment instruments and demographic questions. It will be distributed to all the k-12 teachers in Provincial and First Nation schools in the Northern Educational Region of Saskatchewan. This survey will utilize a modified version of Loyd and Gressards (1984a) Computer Attitude Scale (CAS). It has been modified to include "educational specific" questions. A second instrument will attempt to measure a teacher's "educational" computer competency. This instrument has been derived from a comprehensive list of "educational specific" competencies determined in a study by Scheffler and Logan (1999). Demographic variables such as age, gender, years of experience, access to computers, the internet and e-mail will be queried. Environmental factors such as technical support and inservice support are also included. Further, participants will be asked to respond to questions about what type of activities their students are doing on computers, how often they are doing them and in which subject areas. These "student usage" variables are model on those in *the 1999 Provincial Learning Assessment in Technological Literacy* (Saskatchewan Education, 2001). In addition, those who choose to complete the survey will be asked to volunteer to participate in an interview session. From the list of volunteers, ten will be selected to participate in the interview session. Volunteers will be selected in an attempt to represent the demographic makeup of the target group. Interviews

will be conducted in person, by this researcher, or via telephone. Participants in the interview session will be asked to respond to five questions, which they will receive in advance. It is anticipated that the time to complete the service is between 10 and 15 minutes. Participation in the follow up interview session will require an additional 15 minutes.

No foreseeable risk, side effect and discomforts of any sort are anticipated as a result of your participation in this study. Participation in this study is completely voluntary. Participants can withdraw without fear of penalty or any other reprisal from any institution or employer. In the event that a participant chooses to withdraw from the study after the data collection process has begun, if possible his/her data will be deleted from the study and destroyed.

Anonymity of participants in assured. All data resulting from this study (including audiotapes and transcripts) will be securely stored at the University of Saskatchewan for the required fives after which it will be destroyed. Dr. Leonard F. Proctor, Ph.D., Professor of Curriculum Studies, College of Education, University of Saskatchewan, will be responsible for the secure storage of the data. The participants will be reassured that all responses are anonymous. The names of participants will not appear anywhere in the results. Pseudonyms will be used when reporting research data from the interview sessions. Only aggregate data will be reported to further protect the confidentiality of participants.

The results of this study will be shared with the Faculty of Education at the University of Saskatchewan, the Saskatchewan Department of Education and several northern school divisions and First Nation educational authorities. The results will also be used to complete requirements for a Masters of Education degree, and may be used in the writing of journal articles and conference presentations. A copy of the results will be sent to each school that had teachers participate in the study. All those who participate in the survey questionnaire will be made aware of public access to the finished project at the University of Saskatchewan's educational library, by means of a letter sent to each of the participants.

By completing this survey, you have given your consent to participate. Please keep this letter for your own records. If you volunteer and are selected to participate in the follow up interview session, you will be asked to sign a separate ***Transcript Release Form***. This form will be made available for your perusal at the start of the interview and will require your signature upon the completion of the interview.

This proposed research project has been was reviewed and approved on ethical grounds by the University of Saskatchewan Advisory Committee On Ethics in Behavioral Science Research on January 16, 2002.

I realize that teachers are very busy people, that is why I am truly grateful that you would consider taking the time to complete this survey. Thank you in advance for your participation. If you have any concerns or questions you can contact myself or my advisor, Professor Leonard F. Proctor, Ph.D., at the locations below. Or, in addition, you can

contact the Office of Research Services, University of Saskatchewan directly at (306) 966-4053.

Kelvin J (Toby) Greschner
Box 5000, La Ronge, SK.,
(306) 425-4380

Leonard F. Proctor, Ph.D., (Advisor)
College of Education, Room 3118
University of Saskatchewan
(306) 966-7638

Sincerely,

Kelvin J (Toby) Greschner

TRANSCRIPT RELEASE FORM

I,_____, have reviewed the complete transcript of my personal interview in this study, and have been provided with the opportunity to add, alter, and delete information from the transcript as appropriate. I acknowledge that the transcript accurately reflects what I said in my personal interview with Kelvin (Toby) Greschner. I hereby authorize the release of this transcript to Kelvin (Toby) Greschner to be used in the manner described in the consent form. I have received a copy of this Data/Transcript Release Form for my own records.

_____ _____

Participant Date

_____ _____

Researcher Date

UNIVERSITY OF SASKATCHEWAN
BEHAVIOURAL RESEARCH ETHICS BOARD

http://www.usask.ca/research/ethics.shtml

NAME: Leonard Proctor (K.J. Greschner) **BSC#:** 2001-239
Department of Curriculum Studies

DATE: February 3, 2003

The Behavioural Research Ethics Board has reviewed the revisions to the Application for Ethics Approval for your study "The Relationship Between the Computer and Attitude and Competency of Teachers and the Frequency and Type of Computer Use by Students" (2001-239).

1. Your study was APPROVED January 25, 2002.

2. Any significant changes to your proposed method, or your consent and recruitment procedures should be reported to the Chair for Committee consideration in advance of its implementation.

3. The term of this approval is for 5 years.

4. This approval is valid for five years on the condition that a status report form is submitted annually to the Chair of the Committee. This certificate will automatically be invalidated if a status report form is not received within one month of the anniversary date. Please refer to the website for further instructions: http://www.usask.ca/behavrsc/ethics.shtml

I wish you a successful and informative study.

Dr. Valerie Thompson, Chair
Behavioural Research Ethics Board

VT/ck